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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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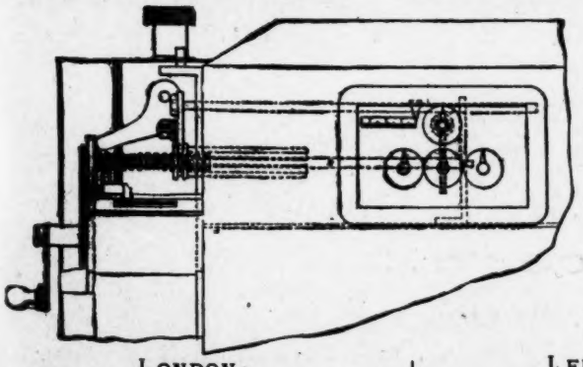

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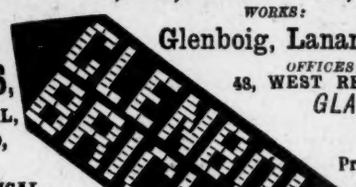

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EDITORIAL NOTES.

Factors in the Financial Issue in South London.

THE accounts that are coming in for the past half year accentuate more than ever the vast importance of the secondary products in the financial issues of gas undertakings. So much is this the case, that we now hardly like to designate these products as "residual;" they occupy a place which entitles them to a description better than one suggesting nothing more than residues. Their contribution to the financial issues of the half year has made what would have been a disastrous condition without their higher yield a success within the limits set by the circumstances in which operations in respect of gas supply are being conducted at the present time. Never again must secondary products be left to come and go as though they had no title to equal technical consideration with the primary product. The half-yearly accounts of the South Metropolitan Gas Company are particularly illustrative of their importance; and they are given special mention in the report signed by the Chairman (Mr. Charles Carpenter, D.Sc.) on behalf of the Directors. It points out: "The half-year's working has "been favourably influenced by the returns from residuals; "and special acknowledgment must be made to the engi- "neering and chemical staffs, to whose endeavours these "results are largely due." This allusion to the part taken by the secondary products (as well as to the important work of the staffs) in the making of the financial results is particularly well-deserved, because to them, it is evident, the proprietors owe considerably the satisfactory accounts, and the consumers the fact that they have been receiving gas during the half year at 2d. per 1000 c.ft. less than the Company's top war charge, which 2d. (assuming it was spread over the whole of the private consumption alone) would represent for the six months £51,459. Noting this sum, adding to it the 5s. 4d. p.ct. increase the holders of the ordinary stock are receiving as dividend compared with the second half of 1915 (making the dividend at the rate of £4 13s. 4d., against £4 8s.), and remarking that from net revenue £19,000 has been transferred to the insurance fund, there will be gratification that there is a profit balance of £33,660 to be carried to the current half year, compared with the £45,716 brought into the past half year. Had it not been for the amount appropriated for insurance, the carry-forward shows that the sum required for the higher dividend has been fully earned.

When making the 2d. reduction from the war price of 2s. 10d. per 1000 c.ft., the Directors had before them the course that in 1916 the secondary products markets were taking; they also knew the position of the coal contracts and probable cost of freight. But the factor that was unknown to them was the consumption of gas for the half year. As to this, in a complex district such as that of the South Metropolitan Gas Company, it is very difficult (apart from the fluctuations of the atmospherical conditions) to prognosticate what is going to happen, and particularly so under compulsory consumption restrictions in various directions. In such circumstances, to show a gain on the consumption of a year ago is something; and the Company are fortunate in having had an increase of 1·02 p.ct. The total sale was 6,281,786,000 c.ft., of which 63,365,000 c.ft. was the increase. But as the public lighting curtailment produced a further decline of 8,293,000 c.ft., it follows that private consumption actually advanced by 71,658,000 c.ft. Digressing for a moment, the total sales last half year are only 5·28 p.ct. behind those for the pre-war corresponding six months (1913), or 350,247,000 c.ft., of which the public lighting accounts for 81,006,000 c.ft. With shop-lighting restrictions, curtailment of the hours of opening of licensed premises, and the operation of the Summer Time Act, the difference is not one for dissatisfaction. The Directors state that the increase in the sales of gas in the half year is due to industrial activity in connection with the war. Whatever its cause or source, it helped to lessen the full measure of the loss of revenue represented by the reduction of 2d. The total income from gas (with the 2s. 8d. price for ordinary consumers) was £801,154, compared with £846,991 (at the 2s. 10d. price) for the December half year of 1915—a difference of £45,837, of which private business accounted for £43,805, and public lighting the remainder.

There was some anticipation that the item of coal would, after what was said six months ago regarding transport in the Company's own steamers, have made some contribution towards compensating for the diminished income due to the lowering of the price of gas. But that it has not done so will probably find explanation in the procuring of supplies rather than in the cost of transport; seeing that in the Directors' report there appears the remark: "The greatest "anxiety in the conduct of the undertaking has been, and "continues to be, the provision of adequate supplies of "coal." This is reflected in two ways. First in the statement dealing with coal deliveries, use, and stocks; and in the actual average cost per ton of the coal carbonized. During the half year, 568,507 tons were received, or 58,996 tons less than in the corresponding six months. The half year began with 24,982 tons less in store than in the second half of 1915. The quantity of coal carbonized (559,105 tons) was 6613 tons more; and an additional 340 tons were used in some other directions. The variations aggregate 90,931 tons, which is the amount by which the coal in store at the end of December (136,269 tons) is short of the 227,200 tons in stock at the end of 1915. The coal into store (including Port of London and tonnage dues) cost £711,996. Dividing this by the 559,105 tons that were carbonized, an average of £1 5s. 5·6d. is obtained, as compared with £1 3s. 4·8d. in the December half of 1915. The cost was thus actually higher by slightly over 2s. per ton. Incidentally, it may be noted that the quantity of gas made, 6,843,669,000 c.ft., gives an average production per ton of coal carbonized of 12,240 c.ft., compared with 12,278 c.ft. in the second half of the preceding year.

Now as to the handsome part that the secondary products have taken in reducing the net cost of coal. They brought in during the half year £536,912, or £139,735 more than in the second half of 1915. Deducting the £536,912 from the expenditure of £711,996 on coal, brings the net cost to £175,084, which compares with £249,290 in the December half of 1915, when coal cost £646,467, and the secondary products yielded £397,177. Thus we see that, though 6613 tons more coal were carbonized last half year, the net cost was lower by £74,206—thanks to the secondary products. To the increased revenue of £139,735 from this source, coke subscribed £83,799. The sale increased by 27,967 tons; but this figure, contrasted with the additional receipts, shows that over the total quantity sold a higher price was obtained. Tar and tar products yielded a further £26,673; and sulphate of ammonia £35,409. But breeze was down by £6147. The total figures will be seen from the accounts published on another page.

In regard to income, mention has not been made of the rental of meters, stoves and fires, and gas-fittings, which amounted to £127,023, or £1992 more. This, combined with "rents" and transfer fees, with the receipts for gas and secondary products, made the total income £1,466,685,

or an improvement of £95,940. The total expenditure was £1,262,521—greater by £109,994. The salient changes contributing to this advance of expenditure are: Increase in the gross cost of coal by £65,529; an advance of £28,019 in the repairs and maintenance of works and plant; while the item of war bonus and war fund, amounting to £65,019, is greater by £33,514. Distribution expenses are down by £18,277; and rents, rates, and taxes, by £12,561. There are smaller variations; and, in the final result, there is a balance on the working for transfer to net revenue account of £204,163, which is short of the sum transferred a year ago by only £14,055. With the accounts all concerned in their making—including the "employee co-partners"—will be satisfied, as will also be the most critical of proprietors. Speaking of the employee co-partners, the words of the Directors should be emphasized: "It is safe to say that "never was the value of co-partnership more manifest than "in the present troubled and anxious times. Its advan- "tages and responsibilities are now shared by some hun- "dreds of women workers."

What of "After the War"?

ALL patriotic gas and coke-oven men who are in the position to apply the oil-washing process are busy extracting the last possible gallon—"possible" in conformity with their circumstances—of crude benzol from gas, in order that it shall stand to their credit that they used to the very utmost their fortunate opportunity to help to promote victory for the Allies. There are other gas men who would most willingly do likewise, if they were not over-ridden by directors and committeemen whose purses have superior consideration to patriotism, even in the present great crisis. These, however, may yet be overtaken by compulsion in place of the existing voluntary work. Circumstances will determine this. But where enthusiasm prevails, development begets development. Among some of the technical gas men who are proceeding ardently in this matter, there is work going forward—work that has never before been done—in the endeavour to raise the recovery of benzol from gas from empirical practice to practice that is governed more completely by the results of scientific investigation, so giving a higher efficiency. The paper, by Mr. T. F. E. Rhead, M.Sc., published last week, on "Some Physico-"Chemical Considerations on Benzol Recovery from Gas," is illustrative of this. But while all this is being done, everybody seems too busily engaged to ask himself what value is all this going to be after the war, and whether anything is being done to ensure that the plant and experience now devoted to the production of explosives material shall have a good commercial place in the country's work on the restoration of peace. On the surface, nothing seems to be moving forward (as it should be doing) to make combination and compact for mutual support as between benzol producers and those who will hereafter be directly or indirectly using it and its concomitants. This is to be regretted, because the plant and the exploration work that has been and is being done (though a great deal more is required) are not by any means of temporary character and service, but, if wisely treated and organized, will continue permanent assets in the country, and contribute considerably to its future prosperity and larger self-dependence.

The full measure of the potential business that awaits these plants is not going to fall automatically to their owners; it will only be obtained by prior conference and thorough organization. We are reminded of this fact by certain remarks by Mr. Walter N. Drew, in a paper read by him before the Midland Institute of Mining, Civil, and Mechanical Engineers, which were reproduced in a paragraph in last week's "JOURNAL." He asked in connection with the extensive recovery of crude benzol that is proceeding: "What will happen after the war?" He spoke of a certain proportion of the crude benzol being absorbed for dyes, and of the future requirement as a motor spirit; and then he put the very pertinent question as to what had been done by producers as a body to prepare for this market? The only reply he could give was: "Nothing whatever." This is, considering the conditions of pre-war times, and the vast changes that have been made since—one of which is the passing of the Gas (Standard of Calorific Power) Act for gas undertakings—a state of affairs that should at once be rectified. Speaking more from the motor spirit point of view (his remarks will apply equally to other uses of benzol or the derivatives), he said that, as far as he knew, if the war were to stop to-morrow, the industry—including gas undertakings—would have no organization whatever, and would be at the mercy of the highly organized petrol combination which had hitherto succeeded in selling an inferior article at a higher price. There is a direct suggestion here for an *ad hoc* organization. We did not go so far as this (but think the idea still further expanded is an excellent one) when writing on March 7 last on the subject of "Dyes "and High Explosives"—the article at that time being suggested by a notable address by Mr. Milton Sharp, the Chairman of the Bradford Dyers' Association. He pointed out that the benzol, toluol, &c., with carbolic, sulphuric, and nitric acids, are among the raw materials from which dyes and high explosives alike are made; and the trend of the article was to show that the crude benzol and rectification plants that had been and were going up at gas-works throughout the country had a dual and convertible national value—a commercial and a martial value. The article then wound up with a suggestion (which reached us from Mr. Thomas Canning) that the Institution of Gas Engineers should take into consideration with organized representatives of the dye users, dye producers, and tar distillers, the question of what arrangements should be made to secure the protection of the home benzol industry after the war.

The position has developed since then, and a suggestion of a much broader character can now be put forward, and, if properly handled, we see no reason why vast good should not issue. There has just been formed an Empire Resources Development Committee, which has for its object the conservation and the development of the resources of the Empire. Why should there not now be established a Benzol Resources Development Committee, whose immediate work should be to enter upon the consideration of the subject of after-war protection of this country's benzol resources by mutual arrangement with the organized representatives of the various industries using benzol and its cognates? There are in existence all the essential elements for such a Committee; and the National Gas Council, as representing the oldest of all the industries concerned, might well make the initial move in the matter of establishing the Committee. It is to be hoped the Council will not consider we are finding it too much work to do. We take it the Executive Committee are pleased to consider all suggestions that contain promise of advantage for the gas industry. And this one, it seems to us, does so. It is the secondary products side of the gas and kindred industries that must be developed; and such development is of national importance. However, as to getting together a suitable Committee to consider and prepare for the post-war situation in regard to benzol, the constituents could be drawn from the National Gas Council, the Coke-Oven Managers' Association, British Dyes Limited, the Bradford Dyers' Association (no doubt there are other organizations concerned with the dyeing and colour industries), and the various Motor Associations. In another direction, there is the Diesel Engine Users' Association, the members of which are anxious to secure the protection of a supply of home produced fuel oils. Surely, with all these interested bodies, something practical and substantial could, by collaboration, be done for the after-war protection of the home benzol and fuel oils resources. The less procrastination in making a move to see what (if anything) can be done, the better.

Local Authorities and the Calorific Standard.

A NUMBER of local authorities have had a conference, which has resulted in a deputation to the Board of Trade, regarding the calorific value standard, which they seem to look upon as something new, and something which has not been discussed to exhaustion, both before Parliamentary Committees and in our columns. These local authorities (who are mostly the owners of electricity undertakings, and so have an interest apart from that which professes to lie in the direction of the gas consumers) do not appear to have anything fresh to say against the granting of Calorific Standard Orders on the terms already laid down, except that in their opinion five years constitutes too long a period before application can be made for revision, and no further Orders should be issued that do not contain reasonable provisions safeguarding the interests of the consumers—we take it they mean in the matter of price. They would like to see the time for making applications for revision curtailed

to twelve months after the war, because "it was possible "new considerations and conditions would arise."

Now if, in legislating for such a matter as this, suppositions and possibilities advanced by authorities running competing trading concerns, but not one of whom is likely unaided to have any technical knowledge of the subject (we see that Mr. W. R. Herring is acting in a consultative capacity for this particular group of municipal malcontents), are to compass enactments with conditions, then we should never get to a finite position. And it is altogether an iniquitous suggestion that gas undertakings that have been—through the legislation with which they are bound, and which did not contemplate such times as the present—seriously hit by the war, but have simultaneously, at still further sacrifice, come to the aid of the country in the greatest of all crises, should have the further uncertainty imposed on them of additional disturbance within a few months after the war is ended. In the circumstances, those who prefer this request for a shortening of the time during which the undertaking should remain undisturbed, take up a position which is totally unjust. Besides, the very suggestion and basis on which it is made are themselves the best proof of insincerity. And this bears upon the proposal as to safeguarding provisions. If conditions arose that would be of disadvantage to the consumers, there would quickly be dissatisfaction; and the gas company, with a powerful corporation running in competition an electric undertaking with the rates at its back, would for its own security have to so order operations as to re-establish satisfaction. The municipal authorities know this; they know, too, from past experience, that the gas concerns are administered by men who have succeeded well in advancing the interests of the private enterprise in face of competition municipally conducted. The solicitude for the consumers (we hear nothing of this where the gas undertakings are municipally controlled) has not the same reality about it as the anxiety not to miss an opportunity for harassing and tightening the bonds upon the gas competitors. Besides this, the Act is only a substituting one—merely substituting one standard for another; and all the safeguards that the consumer requires have been previously provided by Parliament, particularly through the sliding-scale of price and dividend, and other restrictions upon the finances of the companies.

We will not comment upon the few remarks attributed to Mr. Herring in the report forwarded to us by one of our news contributors, as there is obviously missing from them some information which would elucidate the bare assertions. But on the main point raised as to the earliest period that these municipal authorities can again haul the companies before the Board of Trade, in order to secure a review of standard and conditions, the five years is the period that the Ministry of Munitions and the Board of Trade and the Local Government Board in conference agreed would be a just one. There is no reason for any change from what has already been determined after full inquiry and discussion. Persuaded as to the fairness of the terms of the Orders already issued, other gas undertakings have made application for the substitution of the old by the new standard; and it is to be hoped that the three Departments concerned will not, as a result of the conference promised by Mr. Garnham Roper, break faith with the gas undertakings on the application of their business competitors, who have frankly nothing stronger to present in support of their attitude than pure hypothesis. The conditions as they stand are perfectly clear and fair.

A Guardian Body of Provincial Electrical Interests.

THE electrical industry is increasing the number of organizations the interests and functions of which appear to overlap. Perhaps the time will come when, like the gas industry, it will see the prudence of having a capital body by and through which all matters affecting the common policy and interests of the industry will be discussed and negotiated. Of late, the electrical industry has been very busy with the formation of committees charged with the duty of considering the promotion of schemes of a beneficial nature. But now there is in the embryo stage a new body, in which provincial gas undertakings competing with electric supply companies will be particularly interested, inasmuch as it is proposed that all the talent and influence it can command shall be used in protecting and furthering the financial, commercial, and legislative interests of provincial electricity companies working under Provisional Orders. There is already in existence a Committee looking after the affairs of the London Companies; and the municipal undertakings—London and Provincial—have a very active body specially devoted to their particular interests. The planned field of work of the new Committee—comprising, as it does, "financial, commercial, and legislative interests"—is a comprehensive one. When we look into the details so far as they are vouchsafed, the organization appears to have objects in view of similar nature (but limited to the category of the companies mentioned) as those of the National Gas Council, and incorporating, in part, certain of the functions of the British Commercial Gas Association. There is to be a General Committee, and there has already been formed a strong and influential Executive Committee, with Mr. H. B. Renwick as Chairman, the names of the members of which Committee will be found in a paragraph in the "Electric Supply Memoranda" this week. But there is something peculiar about the latest recruit to the electrical forces; and it is that it is wholly a directors' organization. The General Committee is to be composed of a director from each of the subscribing companies; while the Executive is constituted of directors, some of whom we recognize as having had large experience of electrical administration.

The birth of this new Committee shows that the originators of it are of the opinion that the interests which they are banding themselves together to protect and advance have not hitherto been well served through the existing organizations. One of the matters to which especial attention is to be directed is the organizing and arranging for united action as and when occasion arises and such action is deemed necessary. The Committee will also afford facilities for intercourse between the directors of the companies represented on the Committee, with a view to the consideration of questions affecting the common interests. The guardian character of the organization is again found in the statement of the intention to watch over the interests of the subscribing companies, and take any steps expedient with a view to correcting misstatements that may appear in the Public Press. The gas industry itself appreciates, with the memory of the work of the Electricity Publicity Committee still well in mind, the need for being in a position to correct published misstatements. In another way the Committee will be undertaking work similar in character to part of that performed by the British Commercial Gas Association. It is proposed to prepare and distribute among the members statistics or other information of common interest, and to print and issue other literary matters for the use of members desiring to avail themselves of the facilities afforded. This looks like propaganda literature for stimulating the uses of electricity. There are a number of other questions which the Committee are proposing to take under their wing—such as rating, income-tax assessment, excess profits tax, emergency and other legislation, rates for supply, fiscal and other matters generally affecting the companies' interests. Most of these are of purely domestic concern; but questions of electrical legislation and price rates for supply are matters which very much interest statutorily controlled rivals in business. For example, there have been companies, as well as local authorities, who in connection with electricity supply have been guilty of breaking the law by making preferential charges. The other "objects" of the Committee tend to benefit in some way or other the subscribing companies, who may depend with certainty on one thing—that the gas industry will keep an interested eye upon the doings of the new body.

Birmingham's War Loan Scheme.

In various ways, to which attention has been drawn in the Press, many local authorities are assisting to make the War Loan the success that all wish to see it; and these efforts have been fully acknowledged by the President of the Local Government Board. In reply to inquiries on the subject already made of the Department, Lord Rhondda says the following suggestions have been submitted: (1) In the case of such funds as sinking and redemption funds for the repayment of loans, superannuation funds, reserve and depreciation funds, and other moneys which local authorities are required or authorized to invest, the War Loan is an authorized and desirable security for the investment. (2) Local authorities may invest in the loan such part of their revenue balances as is not likely to be required in the near future for meeting their expenditure. (3) Local authorities may enter into

an arrangement with their bankers by which they could purchase a certain amount of War Loan stock, and institute a scheme for enabling persons of small means in their district to purchase such stock by instalment payments spread over a period longer than that for the payment of instalments under the prospectus. This course must not, however, involve any charge on the rates. These schemes are suitable for local authorities generally; but it is wished now to draw special attention to the plan adopted by the Birmingham Corporation Gas Department for assisting all workmen in their employ to take up War Loan stock by means of small weekly instalments. Already, it is said, quite a number of municipal authorities and private employers have applied to the department for copies of the scheme, in order that they may adapt its provisions to their own circumstances. The principle is that for every £5 share the employee pays (in 1s. weekly instalments) a total sum of £5 0s. 9d. spread over 101 weeks. In return for this payment, he will receive, in addition to scrip value £5 in January, 1919, dividends over the two years amounting to 8s. 11d., or a total of £5 8s. 11d. Applicants may apply for £5 or as many multiples thereof as they wish. There are no expenses in connection with the scheme, for all the work is voluntary. No fines will be imposed, and no deductions or penalties are provided for in the scheme. During absence on sick leave, payments will be suspended, and an extension of time will be allowed for the completion of the payments. The Birmingham Gas Department are to be congratulated on having thus devised, for helping the country, a scheme the number of subscribers to which is daily increasing

Leniency for Avoidable Absentees.

The Miners' Federation of Great Britain appears to have been much perturbed over the proposal of the Government to comb-out a further number of men employed at the coal mines, and put into force the threat that has for some time now been before the miners to remove the military service exemption from those men who suffer seriously from the complaint known as "avoidable absenteeism," which was not intended to be covered by the exemption. The South Wales and the Northumberland men, it seems, are the ones who mainly object to the proposal; and their views, and the general feeling on the subject, were the other day laid before the Home Secretary (Sir George Cave) by a deputation from the Federation. A full account of what then transpired has not been published; but, as a result of the interview, the men who have shown a preference to play while the national interests require their work are to be given one more chance, which is of a piece with the infirm policy of Government Departments which has long been witnessed in dealing with the miners. What has now been resolved is that the decision as to persistent absentees shall not be retrospective, but that good behaviour henceforth shall protect even the old wayward ones in this matter. This leniency is not deserved. The men who have been guilty of the meanness of holiday making under the protection of their badge have had warning enough, and have simply smiled at it. When the threat got nearer the stage of a reality, they were the first to resent the interference with their liberty. We hope the Government will not be further played with, and that the Federation will perform a better part in future than speaking in defence of these men, and against vigorous action being taken in respect of them. They do not merit any consideration whatever. Sir George Cave hopes that the Federation will continue their efforts to reduce avoidable absenteeism, and that the Local Absentee Committees will refer to the Colliery Recruiting Courts the cases of men who persist in absenting themselves from work without reasonable excuse. We hope they will.

Coking Industry and Refractory Materials.

The gas industry has not been alone in negligence in regard to refractory materials. Equally indolent has been the coking industry. The only merit the former can claim is that by a few years they preceded the latter in the invasion of the technical region of the production of such materials with the view of obtaining those of the right physical characteristics for the work they were called upon to do. When one considers the large proportion of capital and of outgoings for repairs and maintenance that the carbonizing plant of both industries represents, the long neglect is inexcusable, notwithstanding reliance upon reputable manufacturing firms. With all the work that the gas industry has done in alliance with the fire-brick makers in attempting to place the production of refractory materials on a more scientific basis, Prof. W. G. Fearnsides, M.A., F.G.S., of the Sheffield University, when lecturing to the Midland Section of the Coke-oven Managers' Association, confesses his surprise at the rule-of-thumb methods that still prevail in the mixing of clays, as well as at the degree of uniformity attained by such crude practice. But he fears that, if the mixer who practises the rule-of-thumb procedure, was sent to work a different class of clay in another district, his method might result differently. There must be science brought to bear to produce what is required; for there is not the slightest use in paying for a quality in excess of requirements, any more than it is prudent to put into a bench of ovens or retorts a quality that is below that which will, in the circumstances, render good service, just as in an engineering structure it is the function of the engineer not to waste capital in excess weight and strength, but to design in a manner that will give, at the lowest capital cost, a structure that will render good and lasting duty. The lectures that Prof. Fearnsides is delivering (an abstract of the first of which is published this week) will probably result in closer co-operation between the coking industry and the makers of refractory materials, and the information that the lecturer is imparting will be extremely useful to the end that such collaboration would have in view. In the first lecture, for instance, the physical behaviour is discussed of the two main constituent minerals of fire-clay—kaolin and quartz—when segregated and fired separately; and this is followed by a consideration of how they behave when mixed and fired together. From the investigation, it appears quite evident kaolin and quartz cannot flux each other, and therefore they may be mixed in any proportion without loss of refractory properties by reason of the admixture.

A Revised Certified Occupations List.

There has been issued by the Board of Trade, dated the 1st of this month, a revised list of certified occupations, the principal alteration introduced in which is that men found fit for garrison duty abroad [Category "B1"] will no longer be entitled to be treated as in a certified occupation if they have not reached the age limits stated in the list. Another list is promised in a few weeks, in which the reservations will, it is intimated, be reduced by a further raising of the age limits, especially in the trades not mainly engaged on Government work. The principal alteration in the present list, as compared with that dated Nov. 20 last, has already been mentioned. In addition to this, men engaged in a few occupations are no longer protected by the certified list; but they are not, save in one respect, occupations in which readers of the "JOURNAL" are specially interested. The exception is in connection with collieries. Men who have entered coal mines since Aug. 15, 1915, are no longer entitled to be treated as in a certified occupation. In a number of occupations the age limits have been raised. Among the general reservations applying to all the industries in the country, in the case of works chemists the age for single and married men has been raised from 25 to 27; but where a works chemist is under 27, and is the only man left in this position, he should be treated as in a certified occupation. In metal, engineering, and shipbuilding, married men included under the heading "Other engineering works and iron foundries, engaged in manufacturing, erecting, or repairing machinery or plant for use in industry," have had their age limit raised from 25 to 27. Under "chemical trades," married head laboratory attendants have been similarly dealt with.

British Industries Fair.

Arrangements are well in hand for the forthcoming British Industries Fair, which, under the auspices of the Board of Trade, will be opened on the 26th of this month. There are many more entries than last year; and the exhibiting space will be largely increased. On this occasion, as was the case twelve months ago, the fair will be held partly in the Victoria and Albert Museum, and partly in the Great Hall and certain galleries in the Imperial Institute building. A significant feature of an official announcement on the subject is that the space applied for has been again far in excess of the amount at the disposal of the Board of Trade; and therefore all applications have had to be cut down by 30 to 50 p.ct., and some of the larger ones to an even greater extent. A number of late applications could not, indeed, be entertained at all. The exhibits will embrace a good variety of classes of goods—one of them glass—which formerly were

extensively imported from enemy countries, but which, ever since the Board of Trade held their exhibition of samples of enemy goods at the beginning of the war, have been increasingly produced in this country. "The forthcoming fair may," it is said, "be regarded, therefore, as the reply of the British manufacturer to the foreign competition from which he has suffered." The trades included in the fair this year are, it may be mentioned, the same as were sanctioned by the Ministry of Munitions twelve months ago. In view of the risk of interference with the output of munitions, it has not been possible to include certain trades which would otherwise have been invited to participate. There has, however, since last year been an important development in one respect. That is to say, the Glasgow Corporation are organizing a fair in the city, which will be held concurrently with the one in London, and will embrace certain trades not comprised in the London fair.

SOUTH METROPOLITAN GAS COMPANY.

Directors' Report and Accounts.

THE following is the report of the Directors of the South Metropolitan Gas Company for the six months ended the 31st of December, which, with the accounts (an abstract of which appears below), will be presented to the proprietors at the half-yearly meeting to-morrow week.

The working results for the past half year provide a balance of £33,660 to be carried forward to the next account, after payment of the sliding-scale dividend at the rate of £4 13s. 4d. per cent. per annum, and the addition of £19,000 to the insurance fund. The insurance fund was greatly reduced to meet the difficulties caused by the coal strike of 1912; and it is proposed to build this up year by year as authorized by the Company's Act of Parliament.

The consumption of gas shows an increase of 1·02 per cent. over the corresponding period of last year, and is within 5·28 per cent. of the corresponding pre-war period. It would appear that increased industrial activity in connection with the prosecution of the war has counterbalanced the considerable falling-off in the demand for public and domestic lighting.

The half-year's working has been favourably influenced by the returns from residuals; and special acknowledgment must be made to the engineering and chemical staffs, to whose endeavours these results are largely due.

The greatest anxiety in the conduct of the undertaking has been, and continues to be, the provision of adequate supplies of coal. It is unfortunate that to-day the use of raw coal is permitted without licence or restriction, although the wasted bye-products are urgently needed for war purposes by the nation.

It is safe to say that never was the value of co-partnership more manifest than in the present troubled and anxious times. Its advantages and responsibilities are now shared by some hundreds of women workers.

Two Directors (Mr. Charles Carpenter and Mr. Kenneth Phipson Hawksley) and one Auditor (Mr. Charles Pelham Crookenden, F.C.A.) retire by rotation. They are eligible, and offer themselves for re-election.

CHARLES CARPENTER, Chairman.

709, *Old Kent Road, S.E., Jan.* 31, 1917.

The Accounts.

The following are the principal portions of the accounts accompanying the report:

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 p.ct. is payable on £6,011,224 and £598,671 (Act of 1901, as amended by the Act of 1916) of stock. The amount not paid up (including premiums), under the 1916 Act, is £250,000. The loan capital account shows that the loan capital, the rate of interest on which is 3 p.ct., amounts to £1,798,994 and £96,451 (Act of 1901, as amended by the Act of 1916). The amount remaining to be issued under the Act of 1916 is £500,000. The third statement is the capital account. It stands as follows: Amount received, £5,476,420; nominal amount added by conversion (less premium), £3,028,920—total, £8,505,340. The items of expenditure are as follows:

Capital account to June 30, 1916		£5,299,577 0 3
Expenditure during half year to Dec. 31, 1916—viz.:		
New buildings and machinery in extension of works	£59,949 10 5	
New and additional mains and services	2,245 15 6	
New and additional meters	2,204 18 0	
New and additional stoves	3,079 7 7	
		67,479 11 6
Total expenditure		£5,367,056 11 9
Balance		109,363 8 3
		£5,476,420 0 0
Nominal amount added by conversion, less premium		3,028,920 0 0
Total		£8,505,340 0 0

The net revenue account shows a sum of £187,890 applicable to dividend on the ordinary stock. The balances of the reserve, renewal, and insurance funds stood as follows on Dec. 31 last: Reserve fund, £189,443; renewal fund, £25,713; insurance fund, £77,134.

The following is the revenue account.

REVENUE ACCOUNT—*Expenditure.*

Manufacture of gas—		
Coal into store, including £4018 17s. 7d. for London Port and tonnage dues	£711,996 4 5	
Purification	11,351 5 0	
Salaries of Engineer and Officers at works	23,374 16 2	
Wages (carbonizing)	51,444 18 8	
Repairs and maintenance of works and plant, less £5193 19s. 5d. received for old materials	127,539 1 9	
		£925,706 6 0
Co-partnership		14,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes	£37,259 3 3	
Salaries and wages of officers, including rental clerks	24,692 19 6	
Repair and renewals of meters	25,879 16 4	
Repair and renewals of stoves	33,384 17 10	
Repair and renewals of gas-fittings	19,220 15 2	
		140,437 12 1
Public lamps, labour and materials £15,318 18s. 2d., less £14,376 8s. 10d. received for the same		942 9 4
Rents, rates, and taxes—		
Rents payable	£1,490 14 6	
Rates and taxes	45,071 16 10	
		46,562 11 4
Management—		
Directors' allowance	£2,849 9 10	
Salaries of Secretary, Accountant, and clerks	4,439 9 0	
Collectors { Ordinary	5,763 2 0	
Collectors { Slot meter	11,899 8 2	
Stationery and printing	7,139 19 3	
General charges	14,229 8 1	
Company's Auditors	112 10 0	
		46,433 6 4
Miscellaneous—		
Law charges		371 4 0
Parliamentary charges		417 18 5
Bad debts		1,211 0 2
Stolen from 444 slot meters broken open		74 16 1
Superannuation, sick, and accident funds		17,220 2 0
National Insurance Act charges		2,765 7 6
Gas Referees and Official Auditor		360 1 7
Leasehold renewal fund		1,020 0 0
War Bonus and War fund		65,019 0 1
Total expenditure		£1,261,521 14 11
Balance carried to net revenue account		204,163 6 7
		£1,466,685 1 6

Receipts.

Sale of gas—		
Michaelmas, at 2s. 8d. per 1000 c.ft.	£324,341 17 8	
Christmas, at 2s. 8d. per 1000 c.ft.	465,555 16 2	
	£789,897 13 10	
Public lighting	11,256 13 10	
		£801,154 7 8
Meters at rent	£43,967 11 4	
Stoves and fires at rent	40,127 12 7	
Gas-fittings at rent	42,928 13 4	
		127,023 17 3
Residual products—		
Coke, less labour and cartage	£351,115 0 7	
Breeze, " "	1,736 16 10	
Tar and tar products, less labour	92,191 18 1	
Sulphate of ammonia " "	91,828 6 11	
		536,912 2 5
Rents receivable		1,507 6 8
Transfer fees		87 7 6
Total receipts		£1,466,685 1 6

Total amount paid in salaries for half year, £49,746 15s. 7d.
" " " wages " £341,794 14s. 10d.

Statement of Coal.

In Store June 30, 1916.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1916.
Tons. 128,516	Tons. 568,507	Tons. 559,105	Tons. 1649	Tons. 136,269

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,843,669	Thousands. 111,507	Thousands. 6,1?0,279	Thousands. 6,376,933	24,873

Statement of Residual Products.

Description.	In Store June 30, 1916.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1916.
Coke—tons	9,727	349,440	63,800	257,181	38,186
Breeze—tons	23,014	46,051	28,303	31,135	9,627
Tar—gallons	601,487	5,382,920	5,333,932	..	650,475
Ammoniacal liquor—butts	10,013	202,427	201,852	..	10,588

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £166,348; coke and breeze, £40,725; tar, ammonia, and products, £138,948; and sundry plant and stores, £280,879. The figures this time last year were: Coal, £250,104; coke and breeze, £60,808; tar, ammonia, and products, £72,968; and sundry plant and stores, £312,295. A sum of £74,039, co-partnership bonuses and savings, has been deposited with the Company; and the total of the superannuation and guarantee funds is £116,926. The figures last year were £63,693 and £91,383.

PERSONAL.

Mr. John Mews has been appointed a Director of the European Gas Company, Ltd., in place of the late Mr. H. C. Smith.

Mr. Herbert B. Holliday, an Assistant at the Ilford Gas-Works, under Mr. W. B. Farquhar, has been appointed to a similar position with Mr. W. Baillie, the Engineer and Manager of the Keighley Corporation Gas Department.

Mr. R. P. Ellershaw, who has been engaged for the last two years as foreman at the Whitchurch (Salop) Gas-Works, has been appointed Manager at Bishop's Castle (Salop), out of 32 applicants. Mr. Ellershaw will take up his new duties next week.

Mr. Percy F. Holmes, the Chairman of Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, has been appointed a Justice of the Peace on the Huddersfield Bench. Mr. Holmes is Vice-Chairman of the Society of British Gas Industries, and a member of the Committee of the National Gas Council.

In amplification of a paragraph which appeared in last week's "Journal," it may be stated that Mr. J. C. Belton, the late Engineer of the Chester Gas-Works, resigned from the Company's service on a pension. The new Engineer, Mr. J. H. Noble, who is 26 years of age, has been with the Coventry Corporation Gas Department for eleven years, and has been actively engaged on the works for some five years assisting the Works Manager. He is a good chemist and draughtsman.

Second-Lieutenant Herbert Douglas Lees, of the Border Regiment, son of Mr. Herbert Lees, of Hexham, has been awarded the Military Cross, for gallant and distinguished conduct on the field. The men of his regiment made a dashing attack, in which his Company Commander was killed. Lieutenant Lees gallantly led his men on; and they gained their objective. The award of the Military Cross was made to him on the field, which adds distinction to a coveted honour. In November, 1915, Lieutenant Lees got his Commission in the Border Regiment, having previously been in the Officers' Training Corps of Durham University. Prior to this, he was engaged as Chemist in the laboratory of the Hendon works of the Sunderland Gas Company. He is only 19 years old. His eldest brother, Lieutenant F. P. Lees, fell in France.

OBITUARY.

At a meeting of the Birmingham Gas Committee on Monday of last week, a resolution was passed, on the motion of Alderman Sir Hallewell Rogers (the Chairman), seconded by Alderman Lloyd, placing on record their regret at the death of Mr. Maurice Pollack, who was Chairman of the Committee for fourteen years, and throughout the whole of this period devoted himself assiduously to the work of the department. Recording Mr. Pollack's death, the "Birmingham Post" says that the science of artificial lighting was one which he made peculiarly his own. He recognized the possibillties of electricity, but worked hard to improve and extend the business of the Gas Department, and in this he was eminently successful. Reforms were instituted, the most modern appliances secured, and great improvements were made during his chairmanship. He was instrumental in securing more than one reduction in the price of gas; and another achievement was the development of the prepayment meter system, which in later years became so popular. His work commended itself so highly to the town, that in 1887 he was elected Mayor. At the time of his death, Mr. Pollack was in his 87th year.

Manchester District Institution of Gas Engineers.—The annual meeting of the Institution will be held on Saturday, March 3, when the new President (Mr. W. Whatmough, of Heywood) will deliver his inaugural address, and a paper will be read by Mr. A. E. Mottram, of Ossett, on the "Dehydration of Tar and the Extraction of Benzol."

Pacific Coast Gas Association. — The Pacific Coast Gas Association have taken on a new lease of life, no less than 104 new members having been elected during the past twelve months. The annual convention held at Santa Barbara was a great success; and this record is expected to be beaten at the twenty-fifth convention, which takes place at Santa Cruz in September. Between conventions, the Association are now holding sectional gatherings, for the purpose of keeping the membership together, exchanging ideas, and mapping out activities.

Government Control of Mines.—The "Iron and Coal Trade Review" says that the scheme under which the Government propose to control the mines is still under consideration; but there are indications that the Government intend that the machinery for the safe working of the mines shall remain as at present, and that powers shall be given to Joint District Committees to see that the working regulations are carried out, that absenteeism be strongly dealt with, and every effort made to stimulate production. Wages will be regulated by the existing Conciliation Board, while owners' profits will be based on prices current for home demands, supplies to our Allies, and increased working costs.

ELECTRICITY SUPPLY MEMORANDA.

In the "Memoranda" for Jan. 16, there was reference to the fact that the "Electrician" had been looking with unfeigned pleasure upon the industrial developments that had taken place during 1916 in connection with electricity supply. At the same time, it deplored the fact that, notwithstanding these developments, and regardless of the shortage of coal, waste is still allowed to go almost unchecked in "certain important manufacturing districts," and that there are those who think that, because they have the means to purchase a ton of coal, they have the right to use it just as they wish. We suggested to our contemporary that it had here missed a rare good opportunity of "slating" those electricity concerns which, through prior negligence, entered the war period with plants demanding several pounds of coal per kilowatt-hour generated. The "Note" writer of our contemporary is stirred to retaliation, and makes a sad mess of it. In the first place, he asks the electricity concerns that extravagantly use coal to observe that for the "hundredth" time he "slates" them. Existing conditions are proof positive that the ninety-and-nine previous "slatings" have been wofully ineffective. We also remarked in our previous comment that the thoughts of our contemporary were obviously on the sinners outside the bounds of the electricity industry, and not upon those within it. This our contemporary emphatically denies. Its memory is short, seeing that it alluded to the waste going on almost unchecked in "certain important manufacturing districts." It may be referred to the electricity generating tale in districts that are not important manufacturing ones. However, it professes to have had its thoughts on "all the sinners," including those in the gas industry.

Fuel Waste.

The "Sin" of the Gas Industry.

This statement is interesting; and the interest would grow by comparison. But we will content ourselves by examining the assertions of our contemporary. The sinners of the gas industry, we read, think "they have the right to use extravagantly every ton of coal they purchase, and to destroy everything in the coal except its calorific value. It is unnecessary to remind our esteemed contemporary that for *many years* the gas engineers of the country destroyed *most* things that were worth anything in the coal, and that they also used coal extravagantly." We should like our contemporary to essay a justification for these two allegations. As to the first one—the "right" to destroy everything in the coal except its calorific value. Let us see. In exercising this right, an average of say 12,500 c.ft. of gas of upwards of 500 B.Th.U. per c.ft. are obtained; after making a deduction for carbonizing fuel, there remains for sale (say) 10 cwt. of coke; some 10 gallons of tar are produced, from which almost innumerable products are recovered (for proof of which see the coal tar tree recently published by the "Electrical Times"); from the nitrogen in the coal, some 20 to 28 lbs. of sulphate of ammonia are made; from the sulphur extracted from the coal, sulphuric acid is manufactured. This does not exhaust the case. As to the allegation that for "many years" the gas engineers of the country destroyed most things that were worth anything in the coal, we ask our contemporary to state whence for long years past those tar products were realized which have become daily necessaries if not from the tar produced by the gas industry. The bye-product coking industry, be it noted by our electrical friends, is a comparatively modern creation. It would also make the information more precise if actual dates were applied to the "many years." We shall be interested to see the justification of the "Electrician" for its statements, and to discuss the matter with it from the point of view of the details that will, we hope, be submitted. As a final smack, our contemporary remarks that now the gas-engine is outclassed by the electric-motor, our friends are turning their attention to the bye-products. We recommend the "Electrician" to study the accounts of the gas-engine manufacturers to ascertain whether gas-engine making is a decaying industry. As to the attention that is being paid to the extension of bye-product recovery, this is something that is due to the war, which has wrecked the legislative barriers that a mistaken policy had set up as against the gas industry, and from which barriers for years freedom has been sought. Some of our electrical friends wander with uncertain steps directly they slip past the bounds of their own particular territory. However, it is most encouraging to find they are so envious of the secondary products of gas manufacture.

The "75's."

There is a fascination about the numeral "75." On the French front the "75's" are doing remarkably good work, which is not compatible with the comfort of the German forces. At home "75" has also had a great attraction for those people who have so-called fuel-economizing appliances for sale. These are, in print, attributed with the capacity for saving 75 p.ct. of fuel in one form or another. Things that can work to such a marvellous end merit respect—that is to say, if this be their actual economizing capacity. The "Multicooker" saved, in advertisements, but nowhere else, 75 p.ct. of the gas consumed by an ordinary gas-cooker. The "Multicooker" people have had, through the

"Truth" challenge, to make humiliating confession that they cannot substantiate their claim. A well-known Oxford Street electrical firm are also enamoured of a 75 p.ct. economy; and there should be little difficulty on their part in demonstrating that the claim they make is entirely free from any virtuous association. The claim is in an advertisement that has appeared in "The Times." The way to the economy of 75 p.ct. is by forsaking coal consumption and by food cooking and house heating by electrical energy. "Cook your food and heat your house by electrical energy, and save 75 p.ct. of your coal consumption, which saving at the present time is of national importance." To which is added: "A ton of coal consumed in an electrical generating station is equal to 10 tons used in a private house." All savings of coal at the present time are of national importance; and there would be a not immaterial saving if many electricity generating stations were closed-down. The application of the heat energy so derived does not contain in it any economy for an equal amount of service rendered by certain other heating agents. If, taking a figure from the best practice, 3 lbs. of high calorific value coal are used per kilowatt-hour generated, the (say) 45,000 B.Th.U. of the coal find themselves reduced to 3420 B.Th.U.—that is, little better than a 7 p.c. efficiency. The higher the coal consumption the worse the thermal efficiency of the generating process. A bad station, using 12 lbs. per unit generated—and there are some such—would show less than 2 p.ct. efficiency. The electrical firm should attempt to reconcile their statement with the facts. Then take room-heating. Assume that 3 lbs. of coal used at the generating station would deliver into a room 3420 B.Th.U.; assume that the combustion of the 3 lbs. of coal in a grate generated 45,000 B.Th.U., and that 80 p.ct. of this heat was wasted, it would mean that there would be a balance of 9000 B.Th.U. delivered into the room (modern types of coal grates would do better than this). Take 6 lbs. of coal used per unit generated, the electrical heat energy would remain at 3420 B.Th.U., and the heat delivered into the room by the coal grate would be, on the basis here adopted for illustration, 18,000 B.Th.U. We know which room of the two—the one using the electricity provided by the coal consumed at the generating station, or the one using the coal in the grate—we should prefer to sit in during such arctic weather as that recently experienced. The electrical firm, too, are willing in the comparison for the figures referring to house heating by coal to be multiplied by ten, seeing that "a ton of coal consumed in an electrical generating station is equal to 10 tons used in a private house." We should like the electrical firm in question to explain what they actually mean by their statement, or, better still, give us the information on which they founded it. At the same time, they might illustrate cost, by taking rooms of the same cubical capacity, and tell us what would be the relative costs of obtaining and maintaining an equal temperature in them by gas, coal, and electricity. Will the 75 p.ct. economy be reflected in the electricity account? As to electric cooking, the same advertisement states: "Electric cooking shrinks a joint of meat only 5 p.ct., while coal and gas cooking waste at least 25 p.ct." The old fable is getting a bit stronger from the electrical side. Shrinkage in weight has relation to temperature and time; and given equality in these respects, and a corresponding joint of meat, what then has the electrical firm to say?

Patience a Factor in Water Heating by Electricity.

There is something comforting, with the outside temperature—at the moment the thermometer is recording 10° of frost—down to a point it has not reached for two-and-twenty years, in writing about matters appertaining to heating. And so we find interest in the epitome of an article, in the "Electrical Times," by Mr. J. L. Shroyer, of the heating device engineering department of the General Electric Company of Pittsfield, U.S.A., regarding the heating of water for household purposes. We are told in this that the demand for an electric-heater for water has originated from the desire of users of electric cooking ranges to entirely dispense with coal and gas in the house. We have not seen the evidence of such a desire in this country; and, if it did exist, it would be quickly cured by experience. And Mr. Shroyer, with the utmost magnanimity, unintentional though it be, shows why. In the first place, he confesses that since more energy is required to raise the temperature of a given volume of water by 1° than to effect a similar rise in almost any other substance, it is manifest that the application of electricity to water heating must receive careful attention if it is to be practicable and successful, even though efficiencies of 90 p.ct. to 100 p.ct.—that is to say, with electrical energy produced by the low thermal efficiency generating plant as referred to in the preceding paragraph—are "easily obtained" with electric-heaters for water, which 90 to 100 p.ct., however, is not the customary result. He visualizes in words one of the two greatest drawbacks (the other is cost) to water heating by means of electricity when he says: "In view of the large amount of electrical energy required instantaneously to heat water to the required degree in quantities needed for average use, the employment of a storage tank seems desirable, so that the water may be heated gradually and stored until needed. A heater loaded to 40 KW. is necessary to raise the temperature of 25 gallons of water for a bath from 10° to 40° C. in five minutes, or a 20 KW. heater if double the time be allowed. The cost of providing electricity at such a high rate for only intermittent periods is quite prohibitive. A 6 or 10 KW. heater is needed for heating quickly even small quantities of water; and few station engineers can offer a tariff for such a device that would interest private householders. For domestic water supply, therefore, the instantaneous electric-heater is impracticable. Heating units immersed bodily in a storage tank give the highest efficiency; but the system is not the best for domestic supply. The whole volume of water in the tank heats up uniformly; and if the tank be nearly drained for a bath or washing, only tepid or cold water would be available. The method is, however, considered suitable for heating large quantities of water to be drawn off at given periods, or for maintaining a constant temperature in water that is not required to be often drawn off. With the circulating system, a storage tank is used in conjunction with a heater connected to an outside pipe circuit, joined up to the tank top and bottom. The heated water rises and accumulates in the upper portion; and this, despite the heat losses in the circulating system, is the method Mr. Shroyer considers most particularly adapted for domestic requirements. The author proceeds to give a mass of data, all of which shows that the householder has to order his plans and requirements to suit the convenience of the water-heating system; the water-heating system having little respect for the convenience of the householder. This is a reversal of the customary relations of master and servant.

Hidden Deficits.

It has long been noticed how the management of an electric supply undertaking by local authorities in not (from the electrical standpoint) highly favoured districts, sometimes converts highly respectable councillors into adept deceivers in respect of electrical finances. Having entered into speculative trading in electricity supply, it is against the dignity of some of these councillors, if results do not turn out in conformity with estimate, to admit the extent of the losses incurred if they can by any means muddle them away unobserved in some other direction. The members of the Dundalk District Council are no doubt all of the highly respectable brand; and we will not accuse them of being adept deceivers. But we must charge them with having practised a little trickery, which has hitherto prevented disclosure to the ratepayers of the exact financial situation of the electricity undertaking. Perhaps even now the ratepayers would not have been informed as to the position had it not been that the Council have been making application to the Local Government Board for a further loan of £5000, and an inquiry into the matter led to confession. It appears it has been common knowledge that the electricity undertaking has not been making both ends meet; but curiosity has not been satisfied as to how the deficits have been liquidated. It now transpires that up to March last £723 has been lost, and it is estimated (estimates sometimes fail those who make them) that the sum will have an addition to it this year of £537—making a total of £1260. This would not perhaps be a large amount for many undertakings, but it means something fairly weighty for Dundalk. Contrary to what is customary, the losses have not so far been a charge on the rates; but we learn from the "Dundalk Examiner" that the payment of interest and sinking fund has been made in irregular fashion from general funds. Now what has got to happen is that the Council has to do the proper thing with the whole sum of the deficit, and make provision for it in the rates next financial year. Our local contemporary reckons that this will mean a rate of about 10d. in the pound, while, in addition, provision will have to be made for the capital charges of 1917-18. This comes of not letting each year properly bear its own burdens, and of trying to hide the fact of the deficits in order to make the financial position of the undertaking look better than it really is. The ratepayers are hardly likely to appreciate the additional tenpenny rate, when sufficient would have been a penny or twopenny rate at the time deficit occurred.

New Electrical Organization.

In our editorial columns this week, allusion is made to a new development in electrical organization for the purpose of co-operative work in defending and advancing common interests—in this case, of provincial electric supply companies operating under Provisional Orders. The title of the new enterprise is the Provincial Electric Supply Committee of Great Britain. The only reason for reference here, apart from the editorial article, is in order to show that the new enterprise starts off with a strong and influential Executive Committee. The members are: Mr. H. B. Renwick (Chairman), Bournemouth and Poole Electricity Supply Company, Ltd., and other Provincial Companies; Sir J. S. Harmood Banner, M.P., Midland Electric Corporation for Power Distribution, Ltd.; Mr. F. E. Gripper, Edmundson's Electricity Corporation, Ltd.; Mr. G. W. Spencer Hawes, Reading Electric Supply Company, Ltd., and other Provincial Companies; Mr. J. Atkinson Hosker, County of Dorset Electric Supply Company, Ltd., and other Provincial Companies; Mr. W. L. Madgen, British Electrical Federation, Ltd.; Mr. R. P. Sloan, Newcastle-upon-Tyne Electric Supply Company, Ltd.; Mr. J. G. B. Stone, Electric Supply Corporation, Ltd.; Mr. J. C. Wigham, Urban Electric Supply Company, Ltd.; and Sir Henry C. Mance, C.I.E., LL.D., Oxford Electric Supply Company, Ltd.

Mr. Henry Chaloner Smith, of Jersey, a Director of the European Gas Company, Ltd., who died on Dec. 27, left estate of the personal value, so far as can at the present time be ascertained, of £480,000.

DISTILLATION PROCESS IN THE VERTICAL RETORT.

Investigations by Heeren J. N. E. Teune and P. J. Kummel at the South Gas Works, Amsterdam.
[Abstract-Translation from "Het Gas."]

THE investigations here referred to were made on the vertical retort settings at the South Gas-Works, Amsterdam, after they had been in use for two-and-a-half years. They aimed at studying the process of distillation throughout the carbonizing period of twelve hours; and the several results obtained are summarized in this report.

In order to obtain strictly comparable results, the same coal—viz., Graf Bismarck (Westphalian)—was carbonized on all the days devoted to the investigation. This coal gave up 1·95 p. ct. of moisture on air-drying. The air-dried coal contained the following percentages: Moisture, 2·22; ash, 9·96; volatile matter, 33·53; sulphur, 1·62; nitrogen, 1·48. An experimental gas plant, consisting of one retort of a setting in ordinary working, was used in the investigations. In the absence of an exhauster, the pressure on the retort was kept at zero by means of a steam injector at the outlet of the meter. The gas made in it was turned into the hydraulic main of the retort-house. The use of this retort allowed of all the test results being strictly compared with those of normal working.

The retort, which is 4 metres (13 ft. 1½ in.) in length, was filled with coal in the ordinary way to within about 2 ft. of the top. The coal was carbonized in the ordinary way for ten hours, and then steam was introduced and water gas thereby produced for two hours. The gas-meter had its axis geared with that of a small meter, the gas measured by which was taken to a holder for examination and formed an average sample of the whole make during the carbonizing period.

The first step consisted of an analysis of the gas made at each hour of carbonization; crude gas direct from the retort being taken, and a complete analysis of it being made, as well as determinations of the sulphuretted hydrogen and ammonia. Observations were also made of: (1) The gas production every quarter of an hour; (2) the temperature in the core of the charge, by means of a Le Chatelier thermocouple; and (3) temperatures in the setting.

FIRST SET OF OBSERVATIONS.

In the first testing, the retort was charged with 941 lbs. of coal, which in the first ten hours produced 4273 c.ft. of coal gas, and in the next two hours, in which steam at 0·9 atmosphere pressure was introduced into the retort, 1483 c.ft. of gas, which the authors refer to as water gas. The rate of production of gas was nearly uniform at 425 to 460 c.ft. per hour for the first 9½ hours, whereupon it fell to about 280 c.ft. per hour for the next three-quarters of an hour, and rose, with the commencement of steaming, to 777 c.ft. in the eleventh hour and to 706 c.ft. in the twelfth hour. The quantity of mixed gas obtained was equal to 13,696 c.ft. per ton of coal, of which 10,165 c.ft. were coal gas made in the first ten hours, and 3531 c.ft. were "water gas" made in the last two hours.

It is not stated in the original paper at what temperature and pressure the volumes of gas were taken, and in translating them from the metric to the English system, no correction has been made for difference in standard conditions of measurement. If, however, the volumes in the original are cubic metres at 0°C., 760 mm., and dry, instead of at 15°C., 760 mm. and saturated, all the volumes in this translation should be multiplied by 1·0728 in order to get the corresponding figures at 60° Fahr., 30 in., and saturated.

The temperature of these vertical retorts is higher at the bottom than at the top. The temperature observations in the investigations were limited to ascertaining the average temperature in the flues of the setting, and the temperature at two levels in the core of the charge. The settings at Amsterdam have seven flues, and the temperatures at the bottom in the setting averaged 1272° C. (2322° Fahr.), ranging from 1141° to 1325° C., and at the stage level averaged 1124° C. (2055° Fahr.), with a range from 1025° C. to 1172° C. These may all be regarded as normal figures. The changes of temperature in the core of the charge of coal were ascertained by means of two 60-in. Le Chatelier thermo-elements, of which one was inserted through the bottom door to a point 45 in. above it in the charge, and the other through the top lid to 10 in. below the top of the charge. Readings were made every half-hour, and from them the temperature curves given in fig. 1 have been plotted. The curve for the upper part of the charge corresponds fairly well with some German figures published in 1905; and it may be presumed that these were obtained from observations made in the upper part of the retort, though the German observer did not state at what point in the charge his readings were made. The curves now given by the authors are the first measurements published of temperatures at different levels in the core of the charge, and consequently present a better picture of the temperature changes which proceed there.

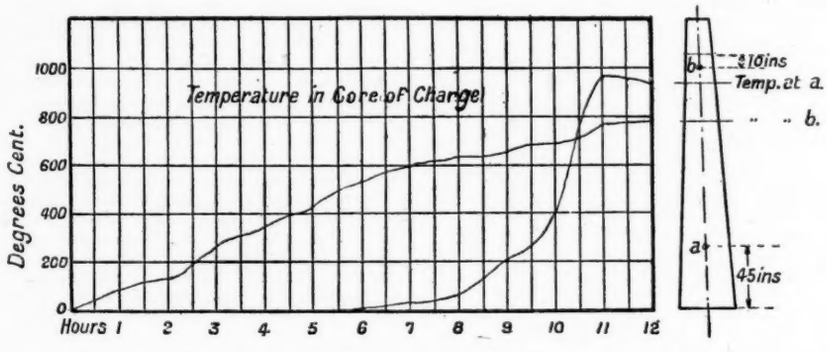


Fig. 1.—Temperature Readings at Two Levels in the Core of the Charge.

Dr. Strache has argued that water-gas production in the vertical retort is not economical, while Mr. Körting and Dr. Geipert

TABLE I.—*Composition of the Crude Gas from Vertical Retorts.*

Hour of Carbonization.	Analysis of Average Sample, Vols. p.Ct.							Sulphuretted Hydrogen.	Ammonia, Ounces per 1000 C.Ft.	
	Carbonic Acid.	Heavy Hydrocarbons.	Oxygen.	Carbonic Oxide.	Methane.	Hydrogen.	Nitrogen.	Vols. p.Ct.	First Half Hour.	Second Half Hour.
First	4·2	6·3	0·1	8·1	42·0	37·4	1·9	2·90	9·60	12·00
Second	2·6	5·4	0·2	8·6	35·1	46·1	2·0	2·25	11·50	12·45
Third	2·6	5·1	0·2	8·1	31·5	50·8	1·7	1·06	13·80	12·10
Fourth	2·6	4·9	0·2	8·3	30·0	51·7	2·3	1·00	11·32	10·30
Fifth	2·6	4·5	0·2	8·8	27·2	54·8	1·9	1·20	9·37	10·30
Sixth	2·2	3·6	0·2	8·6	24·8	58·8	1·8	0·88	9·90	9·90
Seventh	2·0	3·0	0·2	8·8	21·9	62·0	2·1	0·61	8·89	7·87
Eighth	0·6	2·4	0·2	9·6	21·4	63·8	2·0	0·50	8 35	7·90
Ninth	0·6	1·2	0·2	9·3	14·8	72·2	1·7	0·43	7·18	5·29
Tenth	0·4	1·0	0·2	10·4	11·4	74·5	2·1	0·34	3·11	1·31
Eleventh*	7·0	—	0·4	29·2	0·6	59·7	3·1	0·26	0·97	0·44
Twelfth*	10·4	—	0·2	31·4	0·6	54·7	2·7	0·18	0·36	0·20
Average	3·15	3·12	0·21	12·43	21·76	57·21	2·14	0·968	7·68	

* Steam admitted during last two hours.

hold that it is. Strache says that the temperature of the coke is not high enough for the production of good water gas; and the temperature measurements given in the authors' curves support the view so far as the core of the charge is concerned, though the portions of the charge nearer the walls of the retort must be hotter. Analyses of the gas, which will be given later, show that no really good water gas is made in the vertical retort. It had been found in practice that there was a limit to the rate of production of water gas. As the ordinary steam pressure in steaming the retorts at Amsterdam was 0·7 to 0·9 atmosphere, higher pressures were tried, with the result that no increase in the production of water gas was obtained. It thus appeared that the admission of more steam was mere waste. The temperature is only just sufficient to decompose the steam; hence the use of steam at higher pressure cannot be economical. Further tests led to the conclusion that, in order to increase the production of water gas, it would be necessary to use a lower steam pressure and to extend the admission of steam to a longer portion of the total time allotted to working off the charge. This point will be referred to again later.

An average sample of the crude gas made through the twelve hours allowed for carbonization showed the following composition, in volumes per cent.: Carbonic acid, 3·2; heavy hydrocarbons, 3·0; oxygen, 0·2; carbonic oxide, 12·5; methane, 21·5; hydrogen, 56·8; nitrogen, 2·8. It had a gross calorific value of 558 B.Th.U. per c.ft. (temperature not stated, possibly at 0° C.). This analysis agrees very closely with the mean figures of analyses of samples collected during each hour of carbonization. As the analyses of these hourly samples show the progressive change in composition of the gas made, they are reproduced in Table I.

In this table are included also results of estimations of the sulphuretted hydrogen and ammonia produced on other days, when there happened to be rather smaller charges of coal in the retort. The sulphuretted hydrogen determinations were made on the crude gas once an hour—the first a quarter of an hour after charging. The ammonia determinations show the quantity present in the crude gas during half-hourly periods throughout the working-off of the charge. The yield of ammonia averaged 0·3009 p.ct. by weight of the coal carbonized, which is equivalent to 26·16 lbs. of sulphate per ton of coal.

(To be continued.)

GAS OILS IN THE UNITED STATES.

The Rochester Railway and Light Company (N.Y.) have decided to gradually substitute coal gas for the mixture of 85 p.ct. carburetted water gas at present supplied. Some of the reasons that have led to this decision have been communicated to the "American Gas Engineering Journal" by Mr. Herman Russell, the Assistant Manager.

Some four years ago, the Company observed that the steadily increasing prices of gas oils meant an increased cost of $150,000 per annum, which was likely to advance further. Believing in the prospects of a calorific standard for the second district of New York State, they commenced the preparation of a scheme that has now culminated in the awarding of contracts for a large coal-gas plant, which will be completed early in the current year. They will then reduce the percentage of carburetted water gas to 30, and propose to proceed with the extension until it is equal to the production of the whole requirement. The result will be a gas of excellent heating value, more uniform in quality, lower in specific gravity, therefore easier to distribute, better adapted for all household and industrial applications and for incandescent burners, but having less candle power. Therefore the substitution of the cheaper and more efficient mantle lighting for flat-flame burners is recommended. As all appliances in the district supplied are now adjusted for oil-enriched water gas, the change will probably involve an all-round re-adjustment of burners.

Formerly the bulk of the gas was used for illumination, through flat-flame burners. In such circumstances the photometer was an appropriate standard. But now that the mantle has replaced the flat-flame, and the demand for fuel applications has greatly increased, scientific men have for some years recognized that the candle power standard is illogical and unfair, and advised the calorific standard as a substitute. Standards once fixed, however, are difficult to change; and a long campaign of education has been necessary to overcome the inertia of established custom, and to convince regulating authorities that the change is both logical and necessary. The methods of manufacture best suited to the production of a high open flame candle power are not as a rule the most economical or the best adapted to produce a gas of satisfactory calorific value, especially with the rapid rise in the price of oil during the last few years. A liberal consumption of oil is necessary to conform to the usual high candle power standards; and when oil was cheap, the process was economical, though the heating value was not commensurate with the quantity of oil required. At present, however, the enhanced price of oil has confronted many of the gas companies with the necessity for increasing the price of gas. A reasonable calorific standard would relieve the situation by enabling a gradual replacement with processes that do not require much oil enrichment; and the most immediate result will be the substitution of coal gas for carburetted water gas.

The new order came into effect in Rochester on Jan. 1, but will for the moment have little effect on the gas distributed, as it is not possible to appreciably alter the methods in use until the new coal-gas plant is ready for operation.

Many States have been working under a calorific standard for some time; and now that the second district of New York State has adopted it, others will follow, and gas will soon be measured by a standard in harmony with everyday use.

WASTE HEAT FROM RETORT-BENCHES FOR RAISING STEAM.

In a paper read recently before the American Society of Mechanical Engineers, Mr. Arthur D. Pratt stated that it was possible to successfully generate steam from waste outlet gases as low as 950° Fahr. in temperature.

The rate of heat transfer depended on gas velocity and temperature difference between the gas and the absorbing surface; and the effect of increased temperature difference had been proved to be small as compared with increased gas velocity. With coal firing, this difference was approximately 1150°; and the heat transfer rate about 3 B.Th.U. per square foot of surface per degree, affording a heat absorption of 3450 B.Th.U. per square foot per hour. The temperature difference varied widely with the class of waste heat, and with a gas at 1250° entering the furnace, and a working steam pressure of 170 lbs. per square inch, would be about 500°. The average transfer rate, to give an effect equal to that of coal firing, would have to be nearly 7 B.Th.U. per square foot per degree. Although this indicated rather higher gas velocities than were ordinarily used, it had been possible to develop the rated boiler capacity; and high overloads were being obtained with a gas temperature approaching 2000°. The frictional resistance due to increased velocity rendered artificially induced draught an indispensable item of a waste-heat boiler installation, and the fan not only supplied the required draught, but assisted the operation of the primary furnace.

Several installations had been made in connection with retort-benches at gas-works, where the gases at the outlet from a single bed were subject to variation from hour to hour; but the mixed gases from a number of beds were reasonably constant. A boiler having 1330 sq. ft. of heating surface, with superheater fixed, and induced draught fan, was connected to a bench comprising five beds, each of which consumed 211 lbs. of coke per hour. The average temperature taken at the outlet dampers was 1484°; but as the boiler must necessarily be at some distance away, this was reduced to 1225° at the entering point. These figures were obtained soon after starting the bench, and would probably be higher under normal working. The passage through the boiler cooled the gases to the extent of 450°, and developed 106 H.P., or 79·3 p.ct. of the rated capacity, with a draught loss of about 1 in. of water pressure, and made almost sufficient steam for the whole works requirement, including the carburetted water-gas plant. As the draught required is about 2 in., the impracticability of a natural draught by means of the chimney is obvious.

Coal-Tar Colours.

There has been forwarded to us by Messrs. George Allen and Unwin, Ltd., of No. 40, Museum Street, W.C., a large chart showing the derivation of leading coal-tar colours, adapted from the "Coal-Tar Tree" of Herr H. von Brunck (Director of the Badische Anilin und Soda Fabrik) by Mr. Thomas H. Norton. The chart was originally published with the "Oil, Paint, and Drug Reporter," of New York; and it shows in genealogical outline the derivation of 268 of the more important aniline colours. It is clearly printed on good paper, and will be particularly useful to many people just at the present time, when the dye industry of this country (as well as of the United States) is receiving so much attention. Messrs. George Allen and Unwin are acting as sole London Agents for the chart, which may be obtained from them at the price of 3s. 6d. net, *plus* cost of postage.

Calorific Standard Applications.—Applications have been made to the Local Government Board for a calorific standard of 500 B.Th.U. by the Coventry Town Council, the Southport Town Council, and the Torquay Town Council (St. Mary Church works). The Commercial Gas Company have applied to the Board of Trade for an Order fixing a standard of 500 B.Th.U. The Board have made the Order asked for by the Harrogate Gas Company.

Fire Causes in New York.—After collating and analyzing the details of a very large percentage of all fires occurring in New York during 1915, the Actuarial Bureau of the National Board of Fire Underwriters have prepared a list of the causes of the outbreaks. This shows that artificial and natural gas (which are classed among the strictly preventable causes) were responsible for no more than 0·7 p.ct. of the whole number. Electricity is placed among the partly preventable causes, and was responsible for 4·7 p.ct. of the total fires.

GAS-FIRE CONSTRUCTION.

By THOS. NEWTON.

IN the "JOURNAL" for Jan. 16, the Richmond Gas-Stove and Meter Company, Ltd., dealt with certain points concerning gas-fire matters which were raised in the "JOURNAL" for Dec. 12. Their contribution is certainly very interesting; and although the writer of it occasionally labours under a misapprehension, it nevertheless fulfils a useful purpose, inasmuch as the subjects dealt with are of growing importance to the whole gas industry. While not concerned with the trade rivalries of various gas-fire makers, one can appreciate the apprehension lest an appeal to the imagination by means of an effective advertising campaign on the part of one maker should have the effect of dwarfing—if not overwhelming—the intrinsic value of the wares of another maker. Of course, it is always open to some other maker to reply in kind; and as far as advertising goes, we are not long left in ignorance as to the superlative qualities of all the various makers' productions.

RADIANTS

But, taking the matter of radiants, it is proposed that, "if gas undertakings were, as a rule, in a position to carry out tests themselves (as suggested by Mr. Hartley), then a more satisfactory state of affairs would result." This definitely raises the issue—concerning which there has been some misapprehension—as to whether it should be necessary for gas undertakings individually to carry out tests themselves. This is what was referred to when I stated: "This is how not to do it; since the labour entailed in a multiplicity of operations throughout the country would be so much wasted energy that might be diverted into more useful channels, *especially when it is considered that one authoritative series of tests would suffice.*"

The objection raised is not against a series of tests, *per se*, but against an almost endless repetition of them. For example, supposing an authoritative series of tests were conducted at Leeds, why should it be necessary to repeat them subsequently at Carlisle, Cardiff, London, Liverpool, Birmingham, Manchester, and scores of other places? In the presence of a "National Standard Test," gas-fire matters would certainly "receive sufficient thought to enable the merits of the claims advanced for the different designs of fuel to be weighed adequately," even though it might not be possible for gas undertakings to be in a position, as a rule, to carry out tests themselves. By concerted action on the part of both the gas industry and the gas-fire makers, working through the National Gas Council, it might be possible to "hall-mark" certain types of fuel, and abolish others, after an authoritative series of tests had revealed the advantages of the former and the disadvantages of the latter. It might even be worth while to issue a "Certificate of Efficiency" for all types of radiants which conform to an agreed standard; and the standard might be raised as and when required. This idea could very easily be developed to provide a sufficient incentive for manufacturers to strive after increased efficiencies in their productions. By working along some such lines as those indicated, not only would the standardization of radiants be hastened, but also the standardization of efficiency would, to some agreed extent, be secured; while stereotyped complacency would be avoided by providing the incentive referred to.

Admittedly, the foregoing is somewhat of an ideal; but it should not be forgotten that the ideals of yesterday are the actualities of to-day. A short time ago the "Lancet" test might have been considered ideal; but to-day it is accepted as a mere matter of course. The praiseworthy manner in which gas-fire makers have tackled, and triumphantly overcome, successive difficulties inspires the confident hope that they will be equally successful concerning the standardization of fuel.

Let me now refer to the hypothetical cases cited, where "radiant 'A' costs the engineer £50 per annum for renewals (labour excluded) and gives 50 p.ct. efficiency in the standard fire which he employs in the district, while fuel 'B,' bought at the same price per thousand, costs £75 per annum for renewals, and gives 55 p.ct. efficiency. Which would the engineer decide to send out with his fires, other factors being equal?" It may be mentioned that an increase of 50 p.ct. on the cost of the radiants (*plus* labour) seems somewhat high in order to obtain a further 5 p.ct. efficiency. It is quite likely that these conditions would not obtain in actual everyday practice; and 50 p.ct. is probably a gross exaggeration. The writer's experience goes to prove that, when once the radiants are placed in a given fire *in situ*, renewals are rendered necessary more on account of accidental breakages than by reason of inherent weakness in the radiants themselves. The implied superior mechanical strength of radiant "A" as compared with radiant "B" would be unavailing in the majority of accidents. If this be the general experience, then under ordinary conditions it would tend to show that the disparity between the cost of renewing "B" as compared with "A" could not reach 50 p.ct. The striving after efficiency is always worthy of every encouragement; and if, in this case, mechanical strength can be combined with efficiency, so much the better. In this connection, it is somewhat unfortunate that mechanical strength should be emphasised by some makers apart from considerations of efficiency.

BURNERS.

On the all-important question as to the degree of aëration necessary to obtain the best results, the phrase, "the degree of aëration necessary is determined at present by that required to prevent the sooting-up of the radiants," was originally employed. Mr. Hartley is also reported to have said: "Under the ordinary condition of use, the quality of the gas supplied as well as the pressure may vary, with the result that it is found at times that the relative degree of aëration of the flame of a given gas-fire has changed without any alteration having been made in the adjustment of the fire." [See "JOURNAL" for Oct. 24, 1916, CXXXVI., p. 179.]

The lecturer made it clear that what he had in mind was the production of a less sluggish flame as a result of a variation in both the quality and pressure of the gas supplied. This raised the question, "Would not a variation in the quality of the gas in the opposite direction to that indicated in the lecture tend to change the relative degree of aëration of the flames of a given gas-fire, and thus bring the flames to a condition favourable to the sooting-up of the radiants?" [See "JOURNAL" for Dec. 12, Vol. CXXXVI., p. 532.] Now it is contended that, "If the degree of aëration were not sufficient to prevent sooting-up under the conditions mentioned by Mr. Newton, then it would not be capable of definition by the foregoing phrase." [See "JOURNAL" for the 16th ult., *ante* p. 113.] The Richmond Gas-Stove and Meter Co., Ltd., cannot expect to have the argument both ways at one and the same time. If an alteration in the quality of the gas in one direction produces a less sluggish flame, will not an alteration in the quality of the gas in an opposite direction produce a more sluggish flame? Then if the flame be sluggish to begin with, "just sufficiently aërated to prevent the sooting-up of the radiants," will not an alteration in the quality of the gas in a certain direction produce a more sluggish flame, and thus bring about the sooting-up of the radiants? We are told that "sooting of the radiants should be avoided, especially in the interests of the gas engineer, &c." Precisely; and the possibility—not to say the probability—of a gas-fire having sluggish flames sooting-up the radiants under certain conditions would appear one very good reason in favour of high aëration.

Probably only an exhaustive and authoritative series of tests will reconcile the differences between the exponents of high and normal aëration; and in this connection the use of the duplex tap might be employed with advantage.

What was previously stated concerning a "National Standard Test" for fuel might be extended so as to include burners. The invitation to the Gas-Heating Research Committee to assist in solving the problems involved will undoubtedly be endorsed by the whole industry, since a report on these problems by such a Committee should not fail to be highly instructive.

In conclusion, the appreciation expressed by the Richmond Gas-Stove and Meter Co., Ltd., is heartily reciprocated; and it is a pleasure to acknowledge the readiness with which they are prepared to submit the results of many labours to the scrutiny, and for the benefit, of the entire gas industry.

THE VAGARIES OF PUBLIC LIGHTING RESTRICTIONS.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

WHEN visiting the City of Brussels some years ago, I inspected the Palace of Justice, a magnificent building consisting of a coterie of Law Courts, and observed to the guide that jury boxes and prisoners' docks were entirely absent. At first he was disposed to resent the idea of the Palace being in any sense deficient; but on hearing some account of the English jury system, he laughed heartily at the appointment of a butcher, a baker, and then a candlestick maker, selected irrespectively of ability and qualification to decide important issues, and explained that in Brussels such duties would not be entrusted to other than legally trained and competent men.

Since the outbreak of war I have frequently been reminded of this incident, by evidence as to the avoidance of loss and trouble that would follow if our governing powers were only imbued to a greater extent with the view held by the Belgian caretaker, and the importance of appointing appropriate qualified experts on Departmental Committees—lawyers for legal matters, chemists for chemical, engineering for engineering affairs, and so on, or suitable combinations of such specialists, as has indeed been the rule in some instances—notably the inspection under the Alkali Acts, 1906, and, later, in regard to the production of toluol in gas-works, which have efficiently accomplished the desired end without friction, to the satisfaction of all concerned. Smoke inspectors on the same lines would soon make a record in the matter of smoke abatement. Many prominent examples of the evils that attend a contrary procedure might be quoted; and one of these is the important question of public lighting restrictions, which, through lack of

proper competent control, has been the cause of serious casualties and great inconvenience to the public.

All who have occasion to travel from town to town, frequently reaching their destination after dark, must be impressed by the erratic, make-shift, and incompetent manner in which the public lighting is restricted—ranging from a comparatively slight reduction to practically total extinction, in places of similar circumstances as to size and importance. The general practice appears to favour the allotment of this duty to the police department; and while the policeman is most competent and energetic in matters more germane to his ostensible duties, he is not specially qualified in photometry or optics, the properties peculiar to the various kinds of artificial light as determining the distance at which they become unrecognizable by human vision, and other details incidental to a competent and efficient control. His rough-and-ready methods are all very well for a short period restriction in one or two districts; but now that a reduction of some sort is the general thing, and that not over a few weeks, but for several months and possibly years, the likelihood of obtaining practical invisibility at a safe distance—say, 200 yards—combined with the minimum lighting that is compatible with public safety and convenience, as admitting of the absolutely necessary traffic and operations after dark, should be seriously considered, and a committee, comprised of both expert photometrists and experienced airmen, be appointed with a view of ascertaining whether some improvements on the present barbarous methods of total extinction or smudging the glass part of lanterns with partially opaque paint are not practicable.

The subject might be fully investigated from at least three different standpoints: (1) Efficient protection from hostile aircraft. (2) The minimum safe requirement for foot as also for vehicular traffic. (3) Economy in consumption of light-yielding materials, in view of the repeatedly urged need for husbanding coal and oil, which form the basis of those in general use. The first and third conditions are effectively met by total extinction, which also promises a saving in labour and other expenses—a point that the average municipal councillor has not been slow to appreciate. But it is attended by such a toll of accident and inconvenience that a London coroner has expressed the opinion that, out of the two necessary evils, the lighting restriction is not the least. Those who tell us that "people should stay at home" have never appreciated the importance of public lighting, and its absolute necessity in ordinary civilized life. Railway yards and other places must be lighted, and a certain amount of traffic must take place after dark, or our industrial fabric must come to half-time, and in many cases to a complete standstill.

It is possible that entire extinction in the public thoroughfares may stultify itself. In important junction towns, the railway sidings and premises extend perhaps a mile or two through the central parts of the district, and must be fairly well lighted in spite of the fact that they are desirable objectives from the enemy point of view. A line of brilliant lighting, even with all direct rays above the horizontal cut off, may set out the desired area more distinctly to the view of a spectator in an airship than if lost in the maze of a moderate degree of public lighting. The same applies to the continuous motor traffic with flashing acetylene lights that is a regular feature on the principal thoroughfares to and from our numerous military camps, even through otherwise entirely darkened urban streets, as showing the connection between, and respective location of, important places the more clearly because of the surrounding darkness.

Take, as examples of lighting restrictions, (say) a dozen neighbouring towns of similar size. In one we find total extinction, with the exception of less than a dozen heavily obscured lights at important crossings. In another, lanterns containing normal-time light, but obscured by coats of nearly opaque white, blue, or green paint to such an extent as to be little more use than to indicate the position of the posts, and prevent people from running against them. In another, unobscured lamps combined with total extinction at an early hour in the evening are preferred. And in a fourth, lights on every alternate or third lamp-post in the leading thoroughfares; the suburb being left in darkness.

Would it not be practicable to avoid the atrocious disfigurement of the lanterns by using frosted, opal, or coloured glass chimneys over the burners? And would not half illuminating power and half obscuration give the same result in practice, with a consumption of about half the gas, as whole power combined with whole obscuration? Or, given a 100 c.p. light with 90 p.ct. obscuration, is it impossible to get a similar result with a 20 c. light and a 50 p.ct. obstruction, with a saving of 80 p.ct. of the light-giving material? No wonder that ratepayers object to pay for a light that is put under a bushel. If we require a subdued light in a passage or store-room, we do not put on a No. 4. incandescent burner, and fall back on the paint-pot as a means of reducing the light to the extent desired. We either use a small flat-flame burner turned low, or a No. 0 incandescent. Why is it that a similar procedure is not adapted to the public lighting? This also applies to shops and private houses, that waste an enormous amount of light by the obscuration of large burners, instead of substituting quite small ones. And, incidentally, one is reminded of the share taken by the shopkeepers in the effective lighting, under normal circumstances, of our leading commercial thoroughfares. Instead of insisting on the total obscuration of the light from the windows, by dark blinds or other similar means, a "safe" amount of light could be allowed that would assist both the shopkeeper and the wayfarer. A great convenience for travellers and shoppers after dark would be some means for taking a view of the interior of the compartment or shop from outside.

A committee formed on the lines suggested should be able to combine effective safety with convenience and economy; and a simple observation test that could be applied to any source of light *in situ*, and, whether direct or reflected, of its visibility or otherwise at a safe altitude. Such a committee should include an adequate representation on behalf of the gas industry, to ensure that the position is not unfairly exploited in favour of electricity. Endeavours have been made in the way of conveying the impression that the advantages of central control and instantaneous extinction are peculiar to the electric current; although, as a matter of fact, either can be readily arranged with gas, and I have never heard that electricians can produce anything equivalent to the "bye-pass," which is frequently of service as a beacon light.

THE DEVELOPMENT OF COKING.

At a meeting in Newcastle last Saturday week of the Northern Section of the Coke Oven Managers' Association, Prof. P. Phillips Bedson, of Armstrong College, read a paper, which was illustrated by lantern slides, entitled "Some Thoughts Suggested by Coke-Oven Practice."

After referring to a lecture which he delivered nearly twenty years ago, the author went on to say that since then there had been considerable development in the practice of coking with the recovery of bye-products. Many factors had contributed to this change in practice; but there could be little doubt that one factor had been the demonstration by German blast-furnace workers that retort-oven coke, despite its lack of brightness and lustre, was as serviceable in the blast-furnace as that manufactured in the beehive oven. It might be granted that a greater amount of bye-product oven coke was required to produce a ton of cast iron than when beehive-oven coke was employed; but the bye-product oven yielded a greater amount of coke per ton of coal, to say nothing of the value of the bye-products and the convenient manner in which the gases produced might be utilized for a variety of purposes. At the time of the Royal Commission on Coal Supplies in 1903, he pointed out that the retort coke-oven with plant for the recovery of bye-products was a great advance towards the complete utilization of the coal, both thermally and materially. The treatment would yield: (1) A larger proportion of coke, (2) bye-products in the form of ammonia and tar, (3) gases which could be more readily controlled, (4) waste heat which could be utilized for steam raising, and (5) surplus gas available for steam production or for power or illuminating purposes. These were all obtainable with a smaller expenditure of the heat-value of the coal than in beehive ovens.

Of the interdependence of science and industry no better illustration could be found than was afforded by the history of the development of the coal-tar industry; for was it not true, as remarked by Pelletier and Walther in 1838, that chemical operations conducted on a large scale offered opportunities for observing phenomena, investigating laws, and preparing new products which did not present themselves in laboratory experiments? Chemical industry, largely indebted to theory for its progress, repaid the chemist whose assistance she needed by presenting him with new compounds for investigation; and thus science was widened and industry developed. In this way, the manufacture of coal gas and of coke had enriched organic chemistry with many new compounds whose investigation had proved to be of the greatest interest. But for coal gas Faraday's liquid hydrocarbons, butylene and benzene, Kidd's naphthalene, and Dumas and Laurent's para-naphthalene (anthracene) would still have to be discovered. It was in the light of the chemical changes and the products resulting from the thermal treatment of coal that the bye-product coke-oven practice acquired a special interest in the eyes of the chemist; for not only did it afford an example of an almost complete utilization of what to this country was a most valuable asset, but it supplied raw materials from which, as a result of patient investigation and research, the chemist had shown that dyes, colours, perfumes, and drugs could be obtained to vie with Nature's products.

The "Iron Trade Review," of Cleveland, U.S.A., reports that there were 6756 bye-product ovens in the United States on Sept. 1 last year. The annual consumption of coal amounted to 29,827,000 net tons. On the same date there were 2236 bye-product ovens under construction; and when completed, these will consume 13,867,000 net tons of coal per year. The total coke output of completed plants is 22,479,400 net tons per year; while the plants being built on the date named will have a capacity of 10,126,000 net tons per year.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to the Oldham Corporation Gas-Works.

By the kind invitation of the Chairman (Alderman H. Wilde, J.P.) and members of the Oldham Corporation Gas Committee, the members of the Manchester and District Junior Gas Association were enabled last Saturday to visit the gas-works at Hollinwood and at Oldham Central. It was not surprising, despite the arctic meteorological conditions which prevailed, that the attendance was a large one, for the Chief Engineer of the Oldham Corporation Gas Department (Mr. T. Duxbury) has always taken an active interest in the work of the Association, and is one of its few honorary members.

Between sixty and seventy visitors assembled at the Hollinwood Gas-Works, where they were heartily welcomed by Mr. Duxbury, Mr. J. H. Massey, Mr. H. Wrigley, Mr. J. G. Nadin, and other officials of the department. The visitors included several members of the Manchester District Institution of Gas Engineers and most of the members of the Council of the Manchester Junior Gas Association.

THE HOLLINWOOD GAS-WORKS.

Mr. Duxbury, in extending a hearty welcome to his guests, said he wished, on behalf of his Chairman (Alderman Wilde) to say how pleased he was to see them that day. He hoped the visit would prove profitable and instructive. If at any time any of them required additional information or enlightenment on any point, he would be glad to assist them.

The party then divided into sections for a tour round the works. The data supplied by Mr. Duxbury and his staff showed that the Hollinwood gas station has a productive capacity from the coal-gas plant of 4¼ million c.ft. per diem, and from the carburetted water-gas plant of 1¼ million c.ft., with a storage capacity of 7½ million c.ft.

No. 1 retort-house contains sixteen through settings of eights, with regenerative furnaces, compressed air stoking machinery, and hot-coke conveyors.

No. 2 house contains eight settings (64 retorts) of Glover-West vertical retorts erected in 1912, having a productive capacity of 2 million c.ft. per day.

The coal plants consist of breakers, bucket elevators, band conveyors, and overhead coal-hoppers.

There are two Lancashire steam-boilers, each 30 ft. × 8 ft. × 100 lbs., fitted with Wilton's furnaces.

The condensers are of the water-tube type, having a capacity of 3 million c.ft. per day.

The exhausters are of the rotary four-blade type, with direct coupled engines. The single exhauster has a capacity of 3 million c.ft. per day and the twin exhauster 4 million c.ft., which may be worked as a 2 million c.ft. during the summer months.

The rest of the plant consists of toluol scrubbers, naphthalene washers, 3 million c.ft. washer scrubber, eight tower scrubbers eight Green's purifiers each 25 ft. × 25 ft. × 6 ft., with Weck's centre valve worked on the backward rotation system.

There are two station meters and four station governors; also revolving coke screens, coke breaker, and loading hoppers.

The storage accommodation consists of three ordinary telescopic gasholders, one rope-guided, and one spiral holder. The latter was completed in 1912, and has a capacity of 5¼ million c.ft., having four lifts of 40 ft. by 200 ft. diameter. It is the largest spiral holder in the world, and was erected by Messrs. Robert Dempster and Sons, of Elland, at a cost of £24,000. The tank is built of concrete, 7 ft. thick at the bottom and 2 ft. 9 in. at the top. It is 212 ft. in diameter by 41 ft. deep, and cost £14,000.

The carburetted water-gas plant has a productive capacity of 1½ million c.ft. per day, with preparation for a further ½ million set. The plant consists of two separate sets of generators, carburettors, superheaters, scrubbers, washers, condensers, gasholder, engines, boilers, exhausters, purifiers, station meter, oil-tank, pumps, hydraulic lift, dust interceptors, interlocking gear, oil meters, &c.

THE CENTRAL STATION.

The productive capacity of this station is 1,000,000 c.ft. of coal gas per day, with storage capacity of 1¼ million c.ft., consisting of one spiral holder, four lifts, one column-guided with flying lift, and one single-lift holder. The coal is elevated from the Corporation's private siding by means of a band conveyor. There are four settings (16 retorts) of Dempster-Toogood vertical retorts, erected in 1914, having a productive capacity of 1,000,000 c.ft. per day. There is also a complete coal-testing plant, carbonizing 400 tons of coal per annum. The general offices, laboratory, storerooms, pipe yards, and workshops are located at these works.

THE HIGGINSHAW STATION.

These works are connected with the Lancashire and Yorkshire Railway Company's main line, and have a productive capacity of 4 million c.ft. of coal gas per day. The storage capacity is 4 million c.ft., consisting of two spiral holders, four lifts each, and three column-guided holders.

There are four sets of coal-breaking, elevating, and conveying plants, each capable of dealing with 350 tons per day of nine hours.

There are compressed-air stoking machines, hot-coke conveyors, coke screening and loading plant, water-cooled condensers, washers, scrubbers, Green's purifiers, naphthalene washers, two locomotives, &c.

GENERAL.

The total productive capacity of all three works is 10½ million c.ft. per day; and the maximum delivery in one day has been 9,196,000 c.ft.

There are fourteen holders, having a total storage capacity of 12¾ million c.ft.; and all the town gas mains are so connected by means of valves as to be of assistance to each other in foggy weather.

The net price of gas prior to the war was 1s. 5½d. to 1s. 11d. per 1000 c.ft.; and the present price is 1s. 11½d. to 2s. 5d., for all purposes.

TEA AT THE GAS OFFICES.

The inspection of the works lasted close upon three hours; and it was entirely due to the indefatigable pushfulness of Mr. Duxbury and his colleagues that the time-table was so well adhered to. Special cars conveyed members from the Hollinwood works to the Central works; and, by the invitation of the Gas Committee, the visitors were entertained at tea at the Gas Offices.

At the conclusion of the repast,

The PRESIDENT (Mr. S. Carter) considered the attendance was very gratifying, and showed that the action of the Council in reviving the work of the Association was a wise one. He was especially glad to welcome Mr. W. Buckley (of Manchester), their Junior Vice-President, among them once more. Twelve months ago he was abroad on work of national importance; and this prevented him from succeeding to the presidency of the Association. All being well, however, this appointment would be made in the course of a few weeks.

Mr. BUCKLEY moved that their best thanks be offered to Mr. Duxbury, Mr. Massey, Mr. Wrigley, Mr. Nadin, and other officials, who had done their best to make the afternoon's visit a memorable one. They had that afternoon seen two different types of vertical retorts, both, apparently, working very well indeed. They certainly had in Mr. Duxbury an enthusiastic advocate of the vertical system. The plants they had seen that afternoon worked beautifully; and if there was one thing that impressed him above all others, it was the cleanliness and orderliness which prevailed everywhere.

Mr. JAMES STEWART (Rochdale), in seconding the vote, said that as one who was interested in the distribution side, he had greatly enjoyed his visit to the Oldham works. As Mr. Buckley had well said, cleanliness and orderliness were seen to prevail everywhere. It had been an ideal visit.

Mr. DUXBURY, in acknowledging the vote, said he could safely say that the pleasure was on the side of himself and his colleagues. He hoped it would not be the last time they would visit Oldham; and he trusted they would have something else that was new when they came again. Of course, if there were no "juniors," there would be no "seniors." Therefore, it was a most important matter that juniors should devote their energies to gas distribution and gas engineering. With modern plant it was more important than ever that gas engineers should have been thoroughly grounded in the "junior school," so that they would be able to readily contend with any opposition that cropped up. Thirty years ago—when he first commenced gas engineering and managing—nine-tenths of it was mere rule-of-thumb. Nowadays, however, matters were quite different. It was essential that juniors should work and study hard, and persevere not only in ordinary methods of gas making, but in looking ahead with intelligent anticipation to future requirements of the consumers. Personally, he confessed that he felt very optimistic in regard to the uses for gas in the future, for cooking and lighting as well as heating, and they could well hold their own against electricity. This, of course, was a matter for the distribution engineer. Personally, he liked the title of "Distribution Engineer;" and he really thought the time was coming when distribution would be in the hands of a distribution engineer who would have charge of that department entirely. Nowadays there were so many fields for developing gas consumption that the ordinary gas engineer had not the time to devote to the distribution side so much as he would wish. Therefore, he thought that a progressive undertaking should have a separate man who had made a special study of the distribution side, and a special study of the requirements of the consumers. It was, however, very necessary that the distribution expert should have had a special training for the work, so that he could advise correctly. All this, of course, meant that matters would work out better for the gas department as a whole. The engineering side of the profession was equally as important, and it was very necessary that a boy on leaving school should go to the practical work of gas engineering. Attention, too, should be paid to laboratory work. Practice was no good without theory, and theory was no good without practice. It was, perhaps, hard work on young engineers of to-day; but it was work that was absolutely necessary if they were to hold their own with the competitors they had in the field. That they would continue to do this he was sure, from the type of engineer he saw there that afternoon. With regard to the visit, he assured them that Alderman Wilde, his Chairman, and Mr. Arthur Andrew, the General Manager, readily consented to their visit—indeed, both gentlemen recognized the importance of Junior Associations, and encouraged such visits.

COAL-TAR ANALYSIS.

Mr. F. F. MOONEY (Rochdale Road, Manchester) then read a paper entitled "Coal-Tar Analysis," which, with some of the remarks upon it, will be found on p. 255.

The proceedings lasted until a late hour; being terminated by the necessity of members catching "last trains" for their various destinations in different parts of Lancashire.

SOME PHYSICAL PROPERTIES OF THE TWO CHIEF MINERAL CONSTITUENTS OF COKE-OVEN BRICKS.

By W. G. FEARNSIDES, M.A., F.G.S., M.I.M.E., Sorby Professor of Geology in the University of Sheffield.

[A Lecture delivered to the Midland Section of the Coke-Oven Managers' Association, at Sheffield, Jan. 27.]

At the outset, the author apologized for the unfinished condition of his lecture, to which he had been unable to give as much time and thought as he would have wished, owing to stress of Government work. He then gave diagrammatic illustrations of the melting-point curves which control the formation of eutectics for various mixtures of silica with calcium and aluminium oxides. He also drew the attention of his audience to a geological map of Britain, showing how closely most of the better known fire-clay deposits follow the outcrop of the lower coal measures. He said that during the last two years he had been somewhat intimately connected with the fire-brick industry on behalf of the Local Committee of the Ministry of Munitions; and he had been very much surprised at the success usually obtained by the rule-of-thumb methods generally used in the blending of the clays, and was quite impressed by the great uniformity attained by such crude practice. He had found many foremen who were able, merely by feeling the plastic mixture, to tell with some accuracy whether it was properly proportioned and ground; but he feared that if the craftsmen who have experience of one class of clay were sent into another district, the application of their rule-of-thumb methods might have very different results. He had found that over a period of months the variation in the constitution of clays mixed in this manner was as low as 0·5 p.ct. The main portions of the lecture dealt with the polymorphic inversions and chemical rearrangement of molecules which take place when the minerals kaolin and quartz are heated separately or together as follows.

In general, the raw material from which coke-oven bricks are made-up is either a fire-clay or a fire-clay mixed with a greater or less proportion of some crushed silicious rock of such a texture that the fire-clay is able to hold it together. Fire-clays are distinguished from other clays by the circumstance that they are "refractory;" but in mentioning this, it should be pointed out at once that the refractory qualities required of the bricks used in coke-oven constructions are not at all the same as those needed by steel makers, whose furnaces in general work at temperatures several hundred degrees higher than those attained even when the coke-ovens are at top heat. High melting-temperature (above about 1400° C.) is not a quality which is worth paying for in materials for coke-oven lining; and physical stability of the body and chemical inertness of the mineral constituents of the bricks in the presence of certain fluxes at temperatures above 800° C. and below 1100° C. are the criteria which determine the longevity of bricks in coke-oven walls.

All fire-clays are sedimentary deposits, fine-grained in texture, and of highly specialized type, in which the chief characteristic is that hydration and the general chemical break-down of the various mineral constituents of igneous rocks (to which ultimate source all minerals contained in sedimentary deposits owe their origin) has gone as far as it will under ordinary conditions of atmospheric temperature and humidity, and from which break-down products, by long continued soaking in fresh water with frequent renewal of the water, all soluble materials have been removed.

Examined microscopically, the mass of these fire-clays is generally too fine-grained to yield much information as to their average constitution; and when, after washing away the fine material, a sample of the larger fragments is selected for examination, it would appear that, in good-class fire-clays, nine-tenths of the fragments of finite size are angular chips of quartz. From the results of chemical examination, and by comparison of these analyses with analyses of well-recognized mineral materials, it is very generally agreed that the clay base of fire-clay is chemically not dissimilar from the kaolinite of china clay, for which the empyrical formula $Al_2O_3\,2SiO_2\,2H_2O$ is generally accepted.

When a parcel of fire-clay is offered to an intelligent buyer, he will generally appraise its value as a refractory material, mainly upon the closeness with which its composition approximates to that of the mineral kaolinite, with 39·5 p.ct. of alumina, 46·5 p.ct. of SiO_2, and about 14 p.ct. of H_2O; while any other bases—more especially the alkalies and alkaline earths—are considered as detrimental to the quality of the material. Apart from the kaolinite and the quartz, the balance of the composition can usually be expressed (as is the custom in the so-called rational clay analysis) in terms of felspathic material, together with some added hydrate of iron and of aluminium, and perhaps some carbonate of iron or calcium and magnesium.

KAOLIN.

We may next consider how kaolin behaves when heated. By heating small crucibles containing air-dried kaolin in which a thermo-couple was imbedded, and allowing them to plot their time-temperature heating curves, Mellor and his co-workers at the Stoke Ceramic Laboratory discovered that the heating of the purest obtainable Lea Moor kaolin is not a simple process. Mechanically entangled water is given off at temperatures just above 100° C., but the combined water does not come away till 500° C. is passed; and the heat absorption which takes place when this dissociation is in progress, retards the rise of temperature considerably.

When the water of combination has been got rid of, the temperature rise is comparatively regular until 800° C. is passed, at which temperature there is an exothermic reaction, and the temperature rises more rapidly. If the heating is continued beyond 1200° C., a new chemical re-arrangement of the molecules take place, and what Mellor regards as a mixture of $Al_2O_3+2SiO_2$ re-combines as $Al_2O_3SiO_2+SiO_2$, and the mineral silimanite begins to crystallize, with some slight evolution of heat. According to Mellor—and the experiments have recently been repeated with some success in Sheffield—the heating curves of fire-clays are very similar to those of kaolin, with an additional "terrace" in the neighbourhood of 200° C., which seems to belong to the decomposition of those colloidal hydrates of silica and silicate of alumina, and, perhaps, also some hydrates of iron and aluminium, to the presence of which the fire-clays are said to owe their plasticity.

When air-dried fire-clay is gradually heated, it expands a little in the neighbourhood of the temperatures where its water is given off; but on the average it shrinks or contracts continuously right up to those high temperatures at which the rigidity of the mass begins to fail. At the lower temperatures, the contraction may fairly be correlated with loss of water from the solid substance; and, unless this be attended with some almost unbelievable reduction of density due to polymeric dissociation in the $Al_2O_3\,2SiO_2$ which is no longer hydrous, the loss of water must bring about a corresponding increase of porosity in the brick.

When, for the purpose of brick formation, raw clay is mixed with water, the volume of the clay is increased; and when, in passing through the drying shed, the water in the moulded brick is dried-out, it is the surface tension of the water-films which pulls the clay particles together and causes the brick to shrink. When in the course of the burning of the bricks the water has been driven off, and the temperature is not yet high enough for the silicate fluxes to be at work, the causes of the continued shrinkage are somewhat obscure; and though Mellor's observations have persuaded him that within what were the kaolin particles a process analogous to polymerization is affecting the alumina, and perhaps also the silica, this explanation can hardly account for the drawing together of the various individual particles which is the only process by which a brick can continue to contract.

Above 900° C., the increase of density of fire-clay materials proceeds more rapidly, probably because the fluxing temperature of felspathic minerals with silica, which at lower temperatures was colloidal, has been passed. With rise of temperature these eutectic fluids so produced lose their viscosity and spread from the centres at which they are first formed over the surface and into the pores of the dehydrated kaolin grains, and again by surface tension pull the grains together. As the temperature continues to rise, more and more of the materials flux and melt, and so come into action first as viscous liquids, and afterwards spread by surface tension and diffuse into the mass of the particles, which, as they become so permeated by fluid, gradually lose their individuality and merge as in a melt, so that in mass the aggregate takes on the aspect which we describe by saying that it has vitrified.

Up to 900° C., the surfaces of the clay particles which have dried-out and contracted touch only at a few points, so that the brick-body is in the friable condition which is alluded to by the brick-maker when he says that the bricks are biscuiting and have not yet begun to "make." Above 900° C., the fluxes spread with only moderate rapidity, and the chips of felspar which before firing can be identified as scattered through most good-class fire-clays above this temperature, are quickly absorbed and disappear. The process of vitrification by contained fluxes is one which can never be completed instantaneously; and though if, in a specified material, the fixing of the maximum temperature of firing will determine how many, and which, of the fluxes present shall have been brought into operation, it is only by further fixing the rate of rise of temperature above the lower limit of their fluxing temperatures that we can control contraction and other vitrification effects which the "burning off" will produce.

Partly by the spreading of the fluxes over the surfaces of the still solid particles, and partly by the reactions between the fluxes and the particles over which they spread, the concentration of those fluxes at particular points is gradually reduced; and unless

the further rise of temperature brings with it the liquifaction of other materials, it happens that, by the continued firing of the brick at a particular temperature, the supply of fluxes becomes "dried up." In practice, when a particular fire-clay is of such high quality that the bricks become dried up or "short" in course of manufacture, the fire is always taken off before the action has gone too far. Bricks which are "short" by reason of this lack of fluxes, always become "leathery" at the high temperatures which prevail in steel-melting furnaces; and as they are unsuitable for coke-oven construction, and command prices which are high as compared with the normal prices of good-class fire-bricks, which can be made strong by partial vitrification in the burning in the brick-makers' kiln, as a class they should be reserved for the steel makers' use.

When from bricks which consist essentially of clay or kaolinite burnt to the point of vitrification and afterwards allowed to cool, thin slices are cut and examined under the microscope, unless they have been held for so long a time above 1200° C. that the crystals of silimanite formed about that temperature have grown to finite dimensions, there is little to observe except the texture and the circumstance that the bonding material appears to consist of glass. When, after cooling, such bricks are reheated, they appear to expand with a coefficient of expansion which is regular and not very different from that of hard glass or porcelain; and even at temperatures far above those at which in the first heating of the clay the action of the fluxes began to produce pronounced contraction effects, the normal rate of expansion is maintained. Only when, by diminution of its viscosity with rising temperature, the bonding glass becomes once more effectively a liquid, does the vitrification process again begin; and then, of course, the brick shrinking further ceases to behave as a refractory solid.

QUARTZ.

Next after kaolinite, the mineral which is most abundant in the fire-clays mined in this country is quartz, which, in the form of comminuted fragments, has survived unchanged all those processes of weathering and continued soaking in water and the various dilute solutions which abound in soils and in the pores of rocks, the action of which has secured the chemical breakdown of most of the other constituents of igneous rocks. Unlike the silicate of alumina which has combined with water to form kaolinite or clay, quartz behaves as if quite immune from the attack of water at ordinary temperatures; and though in plastic clays there is often plenty of colloidal silicic acid, it would appear that this hydrate of silica has been produced by the weathering of minerals other than quartz.

When quartz is heated, it expands; and even in a mass of aggregated particles, it never shows any signs of shrinkage due to the action either of water-films or, at higher temperatures, to the pulling of the fluxes. From ordinary temperatures up to about 575° C., it maintains its state unchanged; but at this temperature it absorbs some latent heat without changing its density and passes quickly into β. quartz. Above 575° C., the β. quartz expands regularly up to 870° C. By reason of some profound change in the constitution of the silica molecule, quartz as a form of silica becomes metastable above 870° C., and, if time be allowed, and if the environment be suitable, it will break down, and, expanding abruptly and considerably, pass over into a substance indistinguishable from tridymite, which mineral at ordinary temperatures has a density less than 2·33, as compared with the 2·66 of quartz.

In the neighbourhood of 870° C., which is the lowest temperature at which the change from pure quartz to pure tridymite can occur, the energy change involved in the change of phase is slight, and the rate of the inversion comparatively sluggish. When the temperature is raised above 900° C., the energy change involved becomes more considerable. But even up to 1300° C., unless there is some catalytic solvent present to help the migration of the molecules, in quartz particles not more than 1 mm. in diameter many hours are required to complete the conversion. In particular cases where the temperature has not exceeded 1100° C., but has remained above 1000° C., for hours together each day for several years, silica particles in which kernels of β. quartz are surrounded with a zone of tridymite have been known to survive apparently unchanged.

Above 1300° C., unless by reason of very rapid heating the change from α to β quartz at 575° C. has failed to complete itself, the change from quartz to tridymite becomes comparatively rapid. But with very rapid heating it is possible to raise the temperature of metastable quartz until at 1470° C. it quite suddenly loses its crystalline characters, and expanding enormously passes into a thoroughly vitreous mass.

At this same temperature of 1470° C., the tridymite, which should always form if the heating is done slowly, begins to change over into crystobalite, which is an apparently cubic mineral possessed of the very desirable property that it maintains its rigidity up to the temperature of its true melting-point at 1625° C. Since the density of crystobalite (measured at ordinary temperatures) is 2·27, compared with 2·28 to 2·33 of tridymite, this last inversion of silica is not accompanied by any very serious volume change.

THESE CONSTITUENTS MIXED.

Having now considered the physical behaviour of the two main constituent minerals of fire-clay when they are segregated and fired separately, it is interesting to inquire how they behave when mixed and fired together. Almost any pair of chemically related substances mixed together and brought to the temperature region of the melting-point of one of them either react to form new compounds or to some extent dissolve each in the other and form an eutectic which has a lower melting-point than either one of them. Pure kaolin, heated alone, does not melt as a single substance, but heated to 500° C. gives up its water, and at about 1200° C. the dehydrated residue goes over into a mixture of silimanite with some form of silica which is probably tridymite, which on further heating certainly passes into crystobalite; and this mixture itself on cooling separates as forms an eutectic, the melting point for which, as determined by Rankin, is at 1600° C.—only some 25° below the melting-point of crystobalite.

From this, it appears quite evident that kaolin and quartz cannot flux each other, and that therefore these two minerals may be mixed in any proportion with little loss of refractory properties by reason of the admixture.

The PRESIDENT (Mr. George Chrisp), in inviting discussion, expressed his gratitude to Prof. Fearnsides for his excellent and highly educative lecture. Cases of what the lecturer called tridymitization had occurred in his own practical experience, although he had not recognized them as such; for he knew of a brick which was able to stand a high temperature, mechanically strong, and was not attacked by the usual salts, but which, on cooling, splintered at the slightest shock.

Mr. B. W. HAIGH (Barnsley Main) moved a vote of thanks to the lecturer. He said the lecture carried their minds into channels which at one time he had thought were scarcely open to them; and it showed that, as a body, they ought to be thankful for the connection they were able to utilize with the Sheffield University.

Mr. W. GREEN (Manvers Main) thought the Professor had put them on right lines. After what they had heard, they would want to get bricks which would satisfy requirements; and the chief idea on this subject appeared to be that they should have one with such a smooth face that it would readily resist the action of the salting process which was presumed to occur. On this point, he did not think there was any really definite information.

Mr. J. A. WILSON (Staveley), referring to the difficulties of uniform burning in the present type rectangular brick kiln, said it was practically impossible to ensure that all bricks in the kiln should be burned to a regular and consistent temperature; but this was a matter for the brick-makers themselves to take up.

Mr. J. W. LEE (Grassmoor) stated that much useful work had been done some years ago by the gas industry. He thought the first thing for the coke-oven people to do was to ascertain precisely the conditions under which their bricks had to work; and the brick-makers, of whom there were plenty of high standing, would endeavour to supply them according to their requirements. He was grateful to the Professor for laying down certain lines on which this work should commence. He recognized many difficulties in the proper burning of bricks, as it was almost impossible to tell from a casual examination if they were thoroughly burnt or black-hearted; but he felt quite sure the brick-making industry would be willing to co-operate with them to ensure complete success in manufacture.

Mr. A. R. FLEMING (Silverwood) said he had done much experimental work in previous years in the attempt to formulate a specification of a brick as to its constitution, the temperature it had to work at, and other conditions it had to withstand. He had, however, experienced great difficulty in finding suitable apparatus to enable him to carry out these experiments.

Mr. T. H. RILEY (Tinsley Park), in seconding the vote of thanks, expressed the hope that eventually they would be able to procure a brick which would give them a wall-life of ten years.

Prof. FEARNSIDES thanked the members, and remarked that the behaviour of the mineral constituents of their bricks was a matter which they would do well to think about, and he had no doubt that research upon this subject would reward them for any trouble which they might take. It certainly would not be time wasted. He thought it would be advisable to leave over the points raised in the discussion until he should give the second portion of his lecture, which would deal with the "texture" of the bricks.

Dual Lighting Systems for the Home.

That dual systems of gas and electric lighting for the home should be advocated and adopted, so that the customer can rely on either one of the systems in cases of accident to the other, and both can be used when required, was the proposition laid down by Messrs. C. H. French and C. J. van Gieson, in a paper presented at the tenth annual convention of the American Illuminating Engineering Society. Should this idea be put into effect, they said, all engineers and salesmen should be instructed that they must recommend both gas and electricity, and at all times adhere strictly to this plan in their selling arguments. A good lighting installation can be designed equally as well for either gas or electricity; but it would be to the customer's advantage to recommend the dual arrangement. Combination fixtures should not be used, as nearly all those on the market at the present time are inartistic. The complicated arrangement of the units in most types of combination fixtures usually prevents either illuminant from operating in the most effective manner.

COAL-TAR ANALYSIS.

By FREDERICK F. MOONEY, of the Rochdale Road Gas-Works, Manchester.

[A Paper read before the Manchester Junior Gas Association, Feb. 3.]

To-day I take the opportunity of reading to you a paper which is not one iota an engineering one, but which is decidedly chemical, and will, I am afraid, only be of interest, as far as detail is concerned, to those who are chemists. But the aim of the paper will be reached if it interests both engineer and chemist, and at the same time produces trenchant criticism and further investigation. My experience in the coal-tar trade and the gas industry has put me in a position to observe and deduce from two points of view this question of coal-tar analysis. My deductions made me feel like Oliver Twist—I wanted "more." This gave some food for thought, which I have here put into a practical form for tar analysis.

I have no wish to go into the history of coal tar; but let it suffice for me to say that there are many here to-day who will remember the time when tar was, literally speaking, thrown into the street. Now it is of the utmost national importance, both in the manufacture of explosives and for medicinal purposes. To-morrow the great demand will be for dyes; and here, again, it is necessary to fall back on coal-tar products. Only a short time ago it was a common remark for those in the gas industry to say, "We are not tar makers but gas manufacturers." All this I grant; but before long this answer will be greatly modified, because of the good price that will be obtainable for coal tar, which contains certain constituents. At the same time there is no reason at all to believe that the gas consumer will suffer—in fact, he will undoubtedly benefit thereby. One is often astounded at the smallness of knowledge on this subject that is possessed by chemists and engineers.

After these words of introduction, one soon perceives that a once neglected subject is daily gaining a firm footing in the gas industry. It is, therefore, my intention to submit to you a method of analyzing tar.

Allow me, before setting out, to recommend to you a method of tar analysis from a gas-works standpoint, to review the present methods used in different laboratories of the gas industry. Many test for specific gravity, water, and total light oils, and very few (I am afraid) for anything further, unless it is sent to an outside laboratory for a thorough analysis. I do not blame the chemist in charge for this, because he very probably is not given the facility to analyze it further, or he might not be in possession of a method to gratify his desire for further testing. If he refers to books, he is often as much in the dark as ever, because he cannot vouch for authenticity of the method given in the book. But we will assume that, for some reason or other, he reports his tests to the Technical Press. Such tests are valueless to the gas industry. Why is this? Simply because we do not know under what conditions he performed his tests, the amount of tar he used, the size and shape of the vessels, the position of the thermometer, and many other details which will enormously influence the whole tests. Broadly speaking, one chemist's tests cannot be compared with those of another. The majority of the analyses of tar which appear in the Technical Press are not as valuable as they might be, for the reason previously given. I grant, if the tar be completely analyzed to pure products, the figures thus obtained are more valuable and reliable. When the analysis of crude products is reported without specified details as to the method of testing, then the results are not worth another man's time to read. It is the crude products of the tar that are generally estimated in the gas-works laboratory; for to go deep into the analysis of the products on the laboratory scale, much skill and scientific knowledge are required. Unless certain standard regulations are adhered to, any results can be obtained in distillation tests. From the above remarks, it is obvious that the time is ripe when something thould be done in the matter. We have standard methods for testing coal gas; therefore why not some standard method of testing coal tar?

For a move in this direction, I will give you the method used by myself for tar analysis. In doing so, it is not my intention to go into deep chemical points, but to submit a paper which, as I have said before, may prove useful to engineer and chemist. I do not set forth complicated methods of analysis, but those of a simple and reliable nature which I have found in my experience.

SAMPLING.

This is the fundamental; and too much stress cannot be laid on the matter. It is practically impossible to obtain a perfect sample of coal tar, because the amount taken to represent the sample is so small in proportion to the quantity of tar that is sent to the distiller. Thus the relative error is very high. But nevertheless, we should aim at getting as near perfection in the sampling as is possible in the circumstances.

Various methods have been tried, by means of ½ in. piping, to the end of which a tap has been connected. The other end has then been put into the tank or barrel, the tap closed, and the whole withdrawn; and the tar thus taken out is allowed to flow into a receptacle by reopening the tap. A piece of glass tubing has been tried, where the same procedure as with the piping is undergone; but one's thumb is used instead of the tap. Such methods, I emphatically condemn. The courage for my conviction is this: We will assume for argument that a nine-ton tar barrel is being sampled, either by means of iron piping or glass tubing. When the pipe or tube is withdrawn from the barrel, we find tar slowly flowing away, although the tap is closed; and by the time it is transferred to the receptacle for the sample, an appreciable portion of the tar has been lost. On analysis of the tar, a very high water content is found. In my own experience I have found it to be 5 p.ct. higher than it really was. Assuming that the real water content should be 5 gallons per ton of tar, then the water content with the above method of sampling will give, as a round figure, 15 gallons per ton. Assuming the distiller, on his test, to have obtained 5 gallons per ton, which result he is in a better position to verify than the gas manufacturer, the average of the results is taken. This means that 5 gallons of tar per ton are being sold as water. It is not until this question of sampling is put numerically that one fully conceives the importance of it. The query then is: Why should the latter method of sampling give a high water figure? It is probably due to the different densities and capillarity.

The method of sampling which I have found to be the best is as follows: The tar as it is being sent away in tanks is well agitated therein by means of a long wooden rod. When this has been done, a wide-neck bottle is dropped into the tank, and is held by a piece of string; then quickly withdrawn. The bottle should be weighted with a piece of lead. The tar taken should be immediately poured into a ten-gallon tin. Therefore the tar collected over one month will represent the quality of tar sold over that period. The above method is, of course, a very primitive one; but a sample thus taken has proved to be very efficient and true. Personal supervision of this sampling must be given by the chemist himself; otherwise the results are not reliable.

Broadly speaking, this point of sampling only influences the water content of the tar; but this does not affect my method of analysis, as will subsequently be seen.

SPECIFIC GRAVITY.

By means of the specific gravity of the tar, we determine the number of gallons present in every ton. This test is, therefore, valuable from a financial standpoint, although I am afraid the realization of it is somewhat ignored. On calculating the gallons per ton from the specific gravity, it is seen that a difference of ·001 in the specific gravity makes a difference of approximately 0·224 gallon per ton. Therefore, determining the specific gravity by hydrometer, or by weighing (say) 200 c.c. of crude tar and dividing weight by volume, no such accuracy is obtainable.

The method which I have found to give reliable results is as follows: Approximately 20 c.c. of tar are distilled in a 16-oz. flask, until all the water has been driven off. This is noticed when the distillate just entering the condenser is observed to be free from water, and the temperature of the vapour at the point is usually between 170° and 180° C. Then the distillation is stopped; and the distillate, which is a mixture of crude benzol and water, should have been collected in a separating funnel. The aqueous layer is carefully run off. The crude benzol is poured back into the retort, which has been allowed to cool; and the whole is well agitated. Then the specific gravity will be determined on an anhydrous sample. A dry specific gravity bottle (Regnault type) is first weighed. It is then filledw ith water at a temperature as near as possible to 60° Fahr., and weighed again. The bottle is then emptied and carefully dried, and is about three parts filled with the dehydrated tar. The bottle is suspended by a piece of string in a beaker containing water between 50° and 60° C., in order to free the contents from air bubbles. The specific gravity bottle *plus* tar is now suspended in water at 60° Fahr. for one hour. The outside of the bottle is quickly dried and weighed again. The specific gravity bottle is filled up with distilled water and the whole (bottle + water + tar) is allowed to stand in a water bath to regain the temperature of 60° Fahr. It is immediately dried and weighed; and the specific gravity of the dehydrated tar is easily calculated from the following formula:

$$\frac{C-A}{(B-A)-(D-C)} = \text{Specific gravity}$$

Where A = weight of specific gravity bottle
B = " " " *plus* water
C = " " " " tar
D = " " " " " + water

DISTILLATION OF THE TAR.

In this part of the paper, it is necessary to say a few words on distillation. It is generally advocated to use 5 cwt. of tar, or, better still, 1 ton; and the whole is distilled from a small still. This I give my appreciation here; but it is a method which is very little adhered to in gas-works, and the gas-works chemist has to make his tests on a few thousand c.c. Therefore what facilities the chemist has he must take advantage of. Although 2240 grams is a very small amount, this could be made to be more informative than it is at present. If the chemist were to make a full test of the tar in the laboratory, and then compare his results with those of the tar distiller, much very valuable information could be obtained.

DISTILLATION APPARATUS.

The retort is made of copper, with a thermometer so arranged that the actual temperature of the vapour is obtained. The thermome-

ter is shielded by means of a piece of asbestos, so that it is not subjected to the radiant heat of the retort. The apparatus should be protected as much as possible from draughts; otherwise fluctuation of the thermometer will be observed during the distillation. Owing to the great length of the thermometer exposed to the atmosphere, it is advantageous to place round it a piece of paper which shields all parts exposed, except where the thermometer has to be read. The thermometer should register up to 400° C. The retort is fixed to a Liebig condenser, which is filled with water. The length of the inner tube of the condenser is 23 in.

DISTILLATION.

Exactly 2240 grams is weighed in the copper retort, which is first heated from the radiant heat produced from a small bunsen flame, which should be so placed as to heat the side of the retort, and not the bottom. The flame is thus left for a matter of one hour. The flame is now increased and allowed to play on the upper part of the retort, with an occasional heating of the lower part of the retort where the tar actually is. Heating must not be done locally. The flame should circulate all round the retort.

After a time it will be found that a small globule of water and oil has condensed on the bulb of the thermometer. Then the neck of the retort is heated at intervals. The temperature shown on the thermometer at this point will be found to be about 80° C. The temperature slowly rises; and at 90° C. oil and water come over freely. At this stage, a certain amount of ebullition sets up; and therefore the distillation should not be hurried, but the temperature slowly raised. It is first of all noticed that a large amount of water is coming over, and only a small amount of oil; and as the temperature rises more oil comes over and less water, until a temperature of about 175° to 185° C. is reached. At this temperature it is observed that very little water is coming off. This phenomenon is always seen where the distillate just enters the condenser. At a temperature of about 185° C. the water is no longer seen in the distillate just entering the condenser; and this is immediately noticed by the appearance of a light green coloured oil distilling over. When this is observed, another 5 c.c. (approximately) is allowed to distil over, to make sure that all the water has been removed. The distillation is now stopped.

The aqueous layer of the distillate, which is the ammonia water, is run off into a tared 100 c.c. measuring cylinder, which is readable to 0·5 c.c. After the water has been carefully separated, and the retort allowed to cool to almost atmospheric conditions, the oil is poured back into the retort, and is well shaken up. The apparatus is then again prepared. Therefore, in the subsequent operations, an anhydrous sample of the tar is distilled.

Heat is applied slowly at first, but is gradually increased as the temperature rises. The first drop will be found to come over between 70° to 80° C. After this, the temperature rapidly rises to 120° C., where it regains more steadiness. The distillate at this stage should come over at about 28 drops per minute, and should be collected in a tared 50 c.c. cylinder. When a temperature of 175° C. is reached, the receiver is changed, and is replaced with a 200 c.c. cylinder. The temperature is now gradually raised, and the distillate allowed to come over at a rate of 60 drops per minute. The water in the Liebig condenser is run off when the thermometer registers a temperature of 190° C. The receiver is changed when a temperature of 220° C. is reached, and is replaced with a tared 16-oz. flask. This fraction sometimes contains an appreciable amount of naphthalene, and care must be taken to see that the condenser does not become blocked with it. The rate of distilling is kept at 60 drops per minute. The receiver is again changed at a temperature of 275° C., and replaced by a second tared 16-oz. flask. The temperature is raised to 330° C., and the rate of distilling is, as before, 60 drops per minute. At 330° C., the distillation is stopped and the retort allowed to cool. To summarize the latter fraction we have: (1) Ammonia water; (2) crude benzol, up to 175° C.; (3) light oils from 175° C. to 220° C.; (4) creosote oils from 220° C. to 275° C.; (5) anthracene oil from 275° C. to 330° C.

The fractions from the latter distillation are weighed in order to obtain the percentage weight of each product. If crude products are thus reported, the results would be comparative with those of any other chemist who has tested by the method I have just given. It is seldom that these crude products are analyzed further in the gas-works' laboratory. At present, no standard method can be given for their further analysis to suit the gas-works; but with the joint work of chemists in the gas industry, this difficulty could probably be overcome. I here set forth information to give an insight into the manner of dealing with these crude products. I do not recommend the analysis I am about to give as a standard, but as lines on which those who can find time for research in the matter can work.

AMMONIA WATER FRACTION.

The ammonia water in the 50 c.c. cylinder is brought to a temperature of 60° Fahr. The cylinder with water is then weighed and the volume noted. From this, the specific gravity is calculated. The ounce strength is then taken by means of a direct titration of 4 c.c. of ammonia water with standard sulphuric acid (1 c.c. = 0·05 gram H_2SO_4). It is as well to note that it often happens that the crude benzol fraction contains traces of water. If this be so, the water is separated and put into the ammonia water fraction.

CRUDE BENZOL FRACTION.

As previously stated, if water is found to have settled out of this fraction, it is separated and transferred to the ammonia water.

SPECIFIC GRAVITY.

The crude benzol, while in a 50 c.c. cylinder, is brought to a temperature of 60° Fahr. It is then weighed and the volume noted.

CRUDE TAR ACIDS.

The tar acids are now extracted from the benzol by means of caustic soda. The aqueous soda used should be made from stick caustic, and should be at a Twaddel 16° (1·08 sp. gr.). It should be twice filtered through glass wool, so as to get rid of any foreign matter that might be suspended in it. Several hundred c.c. of this caustic soda solution are placed in a flask, and heated to a temperature of not more than 40° C. If the caustic soda solution is too hot, a high tar acid figure is obtained. This is probably due to traces of naphthalene, which might have come over in the retort distillation and is extracted with caustic, and estimated as tar acids. The only reason that I can put forward for this is that the hot caustic probably dissolves the naphthalene. The action is purely physical, because, as far as my knowledge goes, there is no chemical action between caustic soda or sodium phenate and naphthalene in the case above named.

The crude benzol is put into a separating funnel, and treated with 10 c.c. of warm caustic soda. The benzol and caustic in the funnel are well agitated for a period of two minutes. The pressure which is produced during this shaking is at intervals released. The whole is now allowed to stand; and when it has settled, the aqueous layer is run off into an 8-oz. flask. The phenate liquor in the flask is neutrailzed and acidified with strong sulphuric (Tw. = 148); and at the same time the flask is cooled under the water-tap. Immediately the phenate becomes acid, a brownish black oil separates out. This is the crude tar acids, with very little, if any, adulterant oil in it, if the washing has been done with ordinary careful chemical skill.

The crude benzol is again washed with 10 c.c. of caustic soda, as previously described. This aqueous layer, when neutralized, will only show traces of tar acids. The benzol is next washed with 5 c.c. of NaOH; and this washing acts as a check wash. In all probability, it will be found that, on acidifying the caustic liquor, no tar acids will be present. This shows that the tar acids have been extracted from the crude benzol.

The tar acids from the two flasks are washed into a separating funnel; and the aqueous layer, which consists of sodium sulphate and excess of sulphuric acid, is carefully run off, until there is nothing in the separating funnel except the crude tar acids. These are run into a 50 c.c. measuring cylinder. The funnel is then washed out with a little distilled water, so as to wash down the traces of tar acids that may have adhered to the sides of the funnel—the washings being run into the 50 c.c. cylinder. The number of c.c. of tar acid present in the crude benzol is then noted; and the latter is washed with 10 c.c. of distilled water.

Allow me to emphasize clearly this fact: The water that the benzol is washed with is not poured in *en masse*, but is sprayed on it by means of a wash-bottle. Again, the water and benzol in the funnel are not agitated up as in the case of caustic and benzol, but are gently shaken round, allowed to settle, and the water then run off. The benzol is dried by adding a lump of calcium chloride to it, and allowing the oil to pass slowly over it. The benzol is collected in a measuring cylinder, and the c.c. noted; from this the loss that is due to washing for tar acids is determined.

CRUDE PYRIDINE BASES.

The crude benzol is next carefully drained into a separating funnel. It is then washed with 8 c.c. of sulphuric acid (sp. gr., 1·325). Shake the benzol and acid for one minute, and release the pressure, which is derived from the evolution of heat in the small amount of sulphonation that is taking place. It is allowed to settle; and then the acid layer is run off into a flask. The contents of the flask are gently made alkaline with ammonium hydrate, keeping the flask quite cool while this is being done. When alkaline, it will be observed that the pyridine bases have been precipitated as a brownish black oil. The benzol is again washed with 8 c.c. of sulphuric (sp. gr., 1·325), and the procedure above described is repeated. Probably in this second wash very little (if any) pyridine is noted. If it happens that some is noted, a check-wash of 4 c.c. of sulphuric acid is agitated with the benzol. The whole of these pyridine bases are then washed into a separating funnel, allowed to settle, and the aqueous layer carefully drained off. The bases are run into a 25 c.c. cylinder; and if any adheres to the sides of the funnel, it is washed down into the cylinder with a little distilled water. Now 2 c.c. of the 80° Twaddel caustic soda are added to the pyridine bases, and the whole shaken up. It is now allowed to settle and the c.c. of pyridine read off. The crude benzol is carefully drained into a 25 c.c. measuring cylinder; and the loss in volume due to washing for pyridine bases is thus obtained.

It might be interesting to those who are chemists to know that the sulphuric acid, besides taking pyridine out, also extracts anilin, toluidine, and picoline—toluidine being to toluol as anilin is to benzene. Picoline is isomeric with anilin. The amount of these constituents is too small to trouble about. In this acid-wash certain sulphur compounds are dissolved.

CARBON BISULPHIDE.

If this substance is not removed from the crude benzol, a note to this effect should be shown in the final report. If it is not removed, distillation results of great variance are reported, and

no constancy whatsoever is obtainable. This is due to the amount of carbon bisulphide in the benzol varying so much, and also its vapour tension and low boiling point. Neither sulphuric nor caustic removes it.

The crude benzol is washed with 10 c.c. of cold caustic soda (sp. gr., 1·08). The caustic layer is then run off, and the benzol is at this point washed with 10 c.c. of water, and is then allowed to flow over a lump of calcium chloride.

For the removal of carbon bisulphide, advantage is taken of the fact that alcoholic potash forms potassium xanthate with carbon bisulphide.

$$C_2H_5\diagdown\!\!\diagup O + CS_2 = S\diagdown\!\!\diagup\begin{matrix}OC_2H_5\\SK\end{matrix}$$
$$K$$

The alcoholic potash is prepared by mixing 85 grams of absolute alcohol, which should be free from mineral oil, with 15 grams of caustic potash, whereby a solution of potassium ethylate in absolute alcohol is obtained. The crude benzol is treated with one and a half times its volume of alcoholic potash. The whole is shaken, at intervals, for two hours. Where there is a large amount of carbon bisulphide present, as is usually the case in this fraction, it will be observed that dark yellow needles of potassium xanthate separate out. Sufficient water is then sprayed into the funnel to dissolve these crystals. The aqueous layer is then run off, and the benzol is again washed with: (1) 20 c.c. of water (approximate), (2) 10 c.c. of water (approximate), and the washings are all run into the alcoholic solution of potassium xanthate. The benzol is therefore free from carbon bisulphide.

The carbon bisulphide actually present can be determined in the washings as follows: The washings are acidified with dilute acetic acid. When excess of copper sulphate is added, cupric xanthate is precipitated; and this is filtered, washed, and incinerated. The cupric xanthate is thus weighed as cupric oxide. From this the carbon bisulphide present in the crude benzol is calculated.

Light Oil Fraction.

The cylinder and oil are weighed; and if no naphthalene be crystallized out, the number of c.c. is noted. The yield of tar acids in this fraction is usually very high. It also contains a fair amount of naphthalene. But if the tar acids be high in percentage, then the naphthalene is usually held in solution by the same. Where naphthalene crystallizes out at 60° Fahr., proceed as follows: The naphthalene is shaken up in the oil, and the whole filtered by means of a filter pump, which is stopped when no more oil will come through. The filtrate is then poured into a tared 200 c.c. cylinder, weighed, and the volume noted at 60° Fahr. The naphthalene is kept on the filter for further use.

Crude Tar Acids.

The procedure here is somewhat the same as in the case of crude benzol. The point I discussed in washing the crude benzol for tar acids, concerning the effect of hot caustic soda on naphthalene, has particularly to be borne in mind. The oil is carefully transferred to a separating funnel, and washed with double its volume of caustic soda (sp. gr. 1·08). The whole is then well agitated for three minutes; the pressure produced in the funnel being released at intervals. It is now allowed to stand until a good separation is observed. The aqueous layer is separated, and is acidified with sulphuric acid, 148° Twaddel; the contents on the flask being kept cool under the water-tap during this operation. When an excess of acid is present, a brownish black oil is precipitated. The tar acids in the flask are still kept under the tap until the temperature is approximately reduced to atmospheric. The light oil is now washed with an equal volume of warm caustic soda solution (sp. gr., 1·08), and allowed to settle. The aqueous layer is then run off; and the procedure as in the first washing is repeated. When it is observed that more tar acids have been precipitated, the light oil is now washed with half its volume of warm caustic soda until there is no further precipitate on acidification of the aqueous layer.

The precipitated tar acids are then carefully washed into a separating funnel, and the aqueous layer is run off. The tar acids are at this stage run into the measuring cylinder containing the tar acids which have been separated from the crude benzol. The increase in volume of the amount of crude tar acids present in the light oil is estimated.

The oil is then partially dried by adding a few lumps of calcium chloride to it. Then immediately the oil is allowed to flow out of the funnel drop by drop. From this, it will be seen that the oil is only allowed to flow slowly over the chloride. The oil is collected in a measuring cylinder, and the volume noted at 60° Fahr. A loss is observed due to washing for tar acids.

Crude Pyridine Bases.

The oil is carefully transferred to a separating funnel, and then washed with 10 c.c. of sulphuric acid (sp.gr., 1·325). The whole is well agitated for one minute, allowed to settle, and the aqueous layer run over. It is again washed twice with sulphuric as in the case of estimating crude pyridine in crude benzol.

The pyridine bases in the washings are carefully washed into the separating funnel, and the aqueous layer run off. They are then transferred to the measuring cylinder, which contains the bases from the crude benzol fraction. The increase in volume gives the crude pyridine bases in the light oil.

The light oil, which has now had extracted from it its crude tar acids and crude pyridine bases, is washed with 20 c.c. of cold caustic soda (sp. gr., 1·0). It is washed again with 50 c.c. of distilled water. The whole is allowed to settle, and the water is run off drop by drop. The oil is partially dried in the same manner as after extracting the crude tar acids from it. The oil is run into a measuring cylinder, and the loss due to washing observed.

Retort Distillation.

The crude benzol and light oil, from which have been extracted the tar acids and pyridine bases, are mixed together. The whole is transferred to a glass retort capable of holding 250 c.c. A thermometer is fixed in the retort; the bottom of the bulb of the thermometer being on a level with the lower part of the delivery tube just leaving the retort. It is distilled at the rate of 40 drops per minute; and the volume of the distillate is read off at 100°, 120°, 160°, and 190° C. The residue in the retort is kept for further use; and the distillate is reserved for the next operation.

Final Washing for Fractionation.

The distillate from the retort distillation is transferred to a separating funnel and treated as follows:

(1) Agitate with 40 c c. of sulphuric acid (sp. gr. 1·18).
(2) ,, ,, 10 c.c. ,, ,, (sp. gr. 1·02).
(3) ,, ,, 10 c.c. ,, ,, ,,
(4) Washed with approximately 20 c.c. of distilled water.
(5) ,, ,, ,, 40 c.c. ,, ,,
(6) ,, ,, ,, 40 c.c. ,, ,,
(7) Agitate with 30 c.c. cold caustic soda (sp. gr. 1·0).
(8) Washed with 30 c.c. water Repeat this washing until washings are neutral to litmus. The oil is then dried by passing it over a few lumps of calcium chloride.

Fractionation.

The oil is poured into a 6-oz. flask, and fractionated by means of a three-pear bulb fractionating column. The top of the bulb of the thermometer should be level with the lower part of the delivery tube where it just leaves the fractionating column. At the junction of each bulb is placed a piece of wire gauze, which increases the efficiency of the fractionation. It is fractionated at the rate of 5 drops per minute. Fractions are collected at the following degrees: (1) Up to 100° C.; (2) from 100° to 120° C.; (3) from 120° to 160° C. The fractionating column should be shielded from draughts. The residue in the flask is kept for further use.

The latter methods of testing are a little modified where the naphthalene content of the light oil is very high. It will be noticed that when the tar acids have been extracted, naphthalene crystallizes out. This again proves the statement that the carbolic acid keeps naphthalene in solution. Instead of using cold water for washing, water at 60° C. is always employed. When this is done, very little difficulty will be experienced with the crystallizing out of naphthalene.

Total Tar Acids.

These are separated from the water and run into a tared 50 c.c. cylinder and weighed, and the volume noted at 60° Fahr. From the latter we obtain the specific gravity of the crude tar acids. In total crude pyridine bases, the same procedure as in the case of tar acids is gone through.

Creosote Oils.

This fraction usually contains a large amount of naphthalene and high phenoloid bodies. The flask with the creosote oil is weighed. To this the residue from the retort distillation of the crude benzol and light oil, also the residue from the fractionation of the distillate from the crude benzol and light oil, are added. The creosote oil is brought to a temperature of 60° Fahr., and kept at this temperature for six hours; the whole being then well shaken while in the cylinder. The oil is then filtered by means of a filter pump. The filter paper used for this operation should contain the naphthalene (if any) from the light oil fraction, so that the total naphthalene is obtained. The flask is washed out four times with the filtrate, to get rid of the naphthalene which has adhered to the sides. It is filtered until no more oil passes from it. The naphthalene on the filter paper is then carefully dried between filter papers until no oil is observable on the papers, and pressed between filter papers two hours under a weight of 15 lbs. It is then weighed in order to ascertain the total crude naphthalene in the tar. Several grams of the pressed naphthalene are heated in a test tube until liquid, allowed to cool, and the temperature at which crystallization begins is noted.

The filtered oil is transferred to a measuring cylinder, the volume noted at 60° Fahr. and weighed. From this, the specific gravity of the filtered oil is obtained.

Anthracene Oil.

This is a syrupy orange coloured oil, out of which, on cooling, a solid crystallizes. The oil is weighed in the flask at a temperature of 60° Fahr., and kept at this temperature for six hours. While at this temperature, it is filtered by means of a filter pump in the same way as in the creosote oil fraction. The flask is washed out four times with the filtered oil, so as o remove the anthracene that has adhered to the sides of the flask. When the oil ceases to filter through, the anthracene is carefully transferred to a dry filter paper. The oil that is still held by the anthracene is first removed by putting it between filter papers and pressing until there is no oil noticeable on the paper. It is then pressed

by means of a 10 lb. weight for an hour. The anthracene cake thus obtained will be of a greenish colour; and it is at this stage transferred to a weighed watch glass, and dried for two hours in the oven at 212° Fahr. It is allowed to cool and weighed. The filtered oil is carefully poured into a measuring cylinder, and the volume noted at 60° Fahr. and weighed.

PITCH.

The apparatus after cooling is dismantled, and the retort and pitch weighed. From this, the percentage of pitch in the tar is obtained.

TWIST-POINT.

This test needs practice; otherwise the results are very variable. The pitch in the retort is heated up until it is viscous; then a part of it is poured into a mould. It is allowed to cool, and then taken out of the mould. The dimensions of the moulded pitch should be $\frac{1}{2}$ in. × $\frac{1}{2}$ in. × 3 in. The mould is now suspended by a piece of string into a beaker containing water, and the temperature is very slowly raised until 95° Fahr. is reached, when the pitch should be taken out of the water, and an endeavour made to twist it by means of the thumb and first finger on each hand. It is very probable at this temperature that it will not twist easily. Therefore the pitch is immediately put back into the beaker, and is again tried at each degree rise in temperature until it twists without pressure. The temperature at which it twists is noted; this being what is known as the twist-point of the pitch. For those who have never performed this test, it will be advisable to try the twist-point of a known degree of pitch.

Results of Analysis of a Sample of Tar by the Methods Given.

Specific gravity (on dry tar) = 1·201.

CRUDE PRODUCTS AS DISTILLED.

Product.	Percentage Weight on Wet Tar.	Percentage Weight calculated on Dry Tar.	Weight per Ton of Dry Tar. cwt. qrs. lbs.
Ammonia water (13·4 oz. str.) .	3·908	—	—
Crude benzol (up to 175° C.). .	·842	·876	19·62
Light oil (175° C. to 220° C.). .	7·856	8·175	1 2 15·14
Creosote oil (220° to 275° C . .	13·063	13·594	2 1 24·50
Anthracene oil (275° to 330° C.) .	11·942	12·427	2 1 26·30
Pitch	59·465	61·883	12 1 14·17
Loss on distillation	2·916	3·045	— 2 12·20

Tests thus reported to the Technical Press are valuable and informative to all who read them, but could be made still more informative if the crude products were analyzed by a standard method, just as I have given for the estimation of the crude products in the tar. As I have previously stated, no suitable standard method can yet be set down to analyze the products, because a large amount of research work is necessary in the matter.

I hope that the notes I have given in the latter part of the paper on this subject may prove useful to those who are in a position to carry out research and solve this problem.

DISCUSSION.

The PRESIDENT (Mr. S. Carter, of Garston) said the paper was a very interesting one; and it was evident that the author had spent considerable time and thought in its preparation. The subject was, at any rate, somewhat novel to the Association, and would well repay careful study, as they were all more or less concerned with tar analysis.

Mr. W. BUCKLEY (Manchester) said he rather liked the author's method of using radiant heat for the primary distillation. Had he ever noticed in the early stage of distillation a white deposit on the condensing tube? It did not often occur; but he had met with it several times, and found it in each case to be ammonium chloride. Another thing not mentioned by Mr. Mooney was the method of determining solid carbon in the tar. Did the author use the ordinary method of washing the tar with a solvent that would dissolve all the carbon? He also inquired how it was, after distilling off the water, and working on an aqueous tar, there was always a percentage of water in the creosote.

Mr. MOONEY, replying, said, in regard to the water in creosote, he attributed this to destructive distillation, as where it occurred water was always produced. He had only once met with the white solids mentioned by Mr. Buckley; and on that occasion he found it to be ammonium chloride. Regarding the free carbon content, he was not in a position to say anything.

A conversational discussion then followed, in which many of the members took part.

The Manchester Gas Engineership.

At their meeting to-morrow (Wednesday), the Manchester City Council will be asked to consider a recommendation of the Gas Committee, and if approved to temporarily engage Mr. William Newbigging, of Norfolk Street, Manchester, as Consulting Engineer, at a remuneration after the rate of £1000 per annum, in accordance with the terms embodied in an agreement, and to authorize the fixing of the corporate seal to such agreement.

COAL BRIQUETTING.

"Fuel Economy, with Special Reference to Briquetting," was discussed at the January meeting of the Midland Institute of Mining Engineers, in connection with a paper on the subject read previously before the Manchester Geological and Mining Society by Messrs. F. C. A. Lantsberry and J. D. Paton. The former gentleman pointed out that the paper paid particular attention to German methods, because it was considered that there was plenty of information available as to what was being done in this country, but not so much (except possibly among the makers of briquetting machinery) as to what had been done in Germany and on the Continent generally.

Mr. W. N. Drew said he had recently noticed in one or two scientific papers the statement that in certain parts of Germany the pitch was taken from the stills direct to the briquetting machines. He thought this was a matter worthy of consideration from the point of view of economy. In this country, the coal that was usually used for briquetting was a long way from the pitch; and where they got coal which was carbonized for pitch, such coal was not briquetted. Possibly the fact of being able to run the pitch hot might mean considerable economy.

It was urged by Mr. J. A. Yeadon that no stuff about a colliery need be wasted—it could all be utilized, and utilized profitably. Some years ago, he said, people came to his firm and declared that they intended to make briquettes out of coal and Kentish chalk. He thought there was nothing in the scheme, but agreed to make the briquettes. The day before they were to be tested, he made some for his own use, and was astounded to find that briquettes composed of 45 p.ct. coal, 45 p.ct. chalk, and 10 p.ct. pitch, kept up, weight for weight, the steam in the boiler as well as the coal that they had hitherto used. There was no smoke, there was no clinker in the fire-grate, and what they might call the ash that was left was worth 15s. per ton for lime. But for the war, there would at the present time have been two plants working in the South of England for the manufacture of these briquettes. This, however, was a matter for the future. Prof. Goss told them that briquettes, weight for weight, raised more heat than the coal itself. This had also been tested at Nottingham. A plant was installed there for making ovoid briquettes, which had been tested for boilers; and it had been found that, weight for weight, they produced more steam than the coal itself. In briquettes intended for the market they did not want to exceed 12 p.ct. of ash; but in the boilers of their own collieries, they could work up to 30 p.ct. of ash, and still get an advantage out of it.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Gas Institution and Next Year's Meeting.

SIR,—The perusal of the article referring to the Gas Institution's "Transactions" in last week's "JOURNAL" tempts me to make the following suggestion for the consideration of the Council and members of the Institution.

The time will soon arrive when the Council will have to determine where to hold the meeting for 1918; and I think, if it be possible, the ideal place for the meeting would be the City of Paris. The last, and I believe the only previous, meeting of the representative Association of the British gas engineering profession took place in Paris in the year 1878—just forty years ago next year; and as one who took part in it, I have always looked upon it as one of the most pleasant and successful meetings we have ever had. The social amenities were delightful; the weather charming; and the technical results most important.

At the Paris gas-works British gas engineers made their first practical acquaintance with regenerative furnaces. This led to their almost universal adoption in this country, which in its turn has rendered possible all our most modern improvements in retort-house practice—such as heavily-charged horizontal retorts, inclines, and verticals—none of which would have been possible without regenerative furnaces.

It would be the greatest compliment we could pay to our noble Allies. It would give us an opportunity to see, before Time had laid its healing hand upon them, the blessings of "German Kultur" at such places as Rheims, Verdun, and Ypres; and it would enable those of us who desire to do so (and I fear they will be many by 1918) to pay their last tribute of sorrow and affection to those heroic relatives and friends who are sleeping their last long sleep in the sacred soil of France, where they rest side by side with those of our brave Allies who have made the great sacrifice for country, home, and civilization.

If I may, I would therefore like to suggest that the Institution hold the 1918 meeting, if possible, in Paris.

At the coming June meeting, the members, if they so desire, could decide that the meeting for 1918 be held in Paris, or if this terrible war is not over in time, in London or some other place in the British Isles—leaving the final selection to be made by the Council of the Institution in the spring of 1918.

H. TOWNSEND.

Wakefield, Jan. 30, 1917.

LEGAL INTELLIGENCE.

Liability for an Accident with "Gascolite."

A question of considerable interest to vendors of proprietary articles has been raised in the Airdrie Sheriff Court, the settlement of which will be determined on the facts brought out by a proof. Miss Agnes M'Laren sued the Coatbridge Gas Company for £25, restricted for Small Debt Court to £20, for loss, injury, and damages sustained by her through an explosion of a tin of "Gascolite," purchased in the Gas Company's warehouse for use in her father's house. The article had been advertised as "Clark's Gascolite," "grease and paint remover," and "a perfect preparation for removing burned grease from gas-stoves." Directions for use were given, but (says the summons) no direction as to the method of opening the tin. While pursuer was in the act of opening it, in the method usually adopted with tins constructed similarly to the one referred to, an explosion occurred, causing serious injury to her eyes and a severe shock to her nervous system. The accident, she adds, was immediately reported to the defenders, and efforts were made to compromise her claim; but these had failed. Mr. John M'Lachlan (Agent for the Gas Company) took exception to the relevancy of the statement of claim, on the ground that no priority of contract was disclosed between pursuer and defenders. His second defence was that no fault of any kind was alleged against defenders to show why they should be found liable in £20 damages. The circumstances disclosed or complained of were simply that defenders sold a grease remover for gas-stoves—a somewhat strong compound—to someone, probably this lady's father; and that when the tin was opened (they did not know how, but perhaps it was carelessly opened), some of the contents had spurted out, and no doubt struck the girl, and she sustained injury. But these circumstances, he contended, showed no liability on the part of the defenders. The "Gascolite" was not a dangerous thing if properly handled, though it was a strong compound, and not one to apply to the face. It is very difficult to see how the defenders could be found responsible for what took place after it was sold. He asked that the summons be dismissed. Mr. Johnston (the Agent for the pursuer) said the article had been sold for a specific purpose, and as a perfect preparation for removing grease from gas-stoves. It was not meant to burn the eyes of the person who opened it by the usual method. The injury was caused by explosion, as stated, not by squirting from the tin by careless opening. The Sheriff said he would not deny the pursuer the right to a proof; but he thought her Agent was setting himself a very hard task in bringing an action against the sellers of an article of this kind, which could be bought from anybody, for an accident due to the opening of the tin it was in. Proof was fixed for Tuesday, the 13th inst.

MISCELLANEOUS NEWS.

COKE-OVEN MANAGERS' ASSOCIATION DINNER.

The Second Annual Dinner of the Association was held at the Queen's Hotel, Leeds, on Saturday. There was a large attendance; but Lord Moulton, P.C., K.C.B., F.R.S. (Director-General of the Explosives Supply Department of the Ministry of Munitions), was unable to be present owing to illness, and was represented by Mr. A. S Parsons (Director of Raw Materials for the Department of Explosive Supplies), and by Mr. Bazire (Private Secretary). Other representatives of the department were Dr. Spielman, Captain D. B. Hall, R.E., M.P., Lieutenant Montgomery, and Mr. Morris. Among other visitors were Sir William Middlebrook, M.P., Mr. Littlefield, Prof. F. W. Burstall, M.A., Prof. Cobb, and Prof. Fearnsides.

The toast of "The King" was proposed, in felicitous terms, by the PRESIDENT (Mr. G. Chrisp).

Captain HALL, in responding to the toast of the Army and Navy, spoke feelingly of the shortage of munitions in the early part of the war, and cordially thanked the coke-oven and allied industries for the efforts they had made, and the success they had attained, in raising their output of high explosives. He urged upon the members the necessity of maintaining their efforts in the production of coke, benzol, and toluol.

Mr. PARSONS, proposing the toast of the Association, referred to the disappointment of Lord Moulton at being unable to be present. He (Lord Moulton) had been looking forward for some time to meeting the members of the coke-oven industry, to thank them personally for what they had achieved in the output of materials so essential to the carrying on of the war. He felt it a privilege to have been connected in some measure with their work. It had been a great pleasure to him to note the disappearance of the tendency to hold back valuable information gained by practical experience on different plants—which knowledge, under present circumstances, he was of opinion should not be regarded as a trade secret, but as an asset of the country to help to win the war. He (Mr. Parsons) urged them not for one moment to relax their efforts to obtain every ton of coke and every gallon of benzol and toluol it was possible to produce.

Mr. BAZIRE also emphasized the necessity of maintaining the output at the highest possible level.

The PRESIDENT thanked Mr. Parsons and Mr. Bazire for their encouraging remarks. He was glad that one Government Department, at any rate, was aware of the importance of their industry; but the minds of the men in the coke-oven industry were obsessed by the fear that other departments had not thoroughly understood it. Steps were proposed which would seriously vitiate the production of raw materials stated to be so essential to the carrying on of the war. He referred to the question of labour substitution. Unless there was very strong action taken immediately, he was afraid the output of these materials would be very seriously diminished. He ridiculed the idea of women being useful on coke-oven plants in a manual capacity; the conditions being very strenuous. The industry should be placed on a secure footing for the period which would follow the war, so that it might be able to compete with the foreign manufacturers; and he called upon the Government to at once set aside money for research work. He mentioned the fact that very valuable products were still unrecovered, and instanced sulphur, which was so difficult to obtain for the production H_2SO_4. He estimated that a quantity capable of producing 10,000 tons of real monohydrate per month was wasted, although recoverable. The nitrogen, the cyanogen not recovered, the waste of heat energy, made a sad reflection upon their vaunted efficiency. They all might be recovered, if it was known how to do it; and the Government should be pressed to embark upon a policy of research in the field of industrial science. This was the duty of the Government, rather than of private enterprise. Further, he demanded that better educational facilities should be provided for the rising generation of coke-oven men; and he welcomed the assistance they were now receiving. He was offering to the Council of the Association a gold medal for competition among the members for the best paper contributed.

Mr. E. B. HOLLINGWORTH, proposing the toast of "The City and Trades of Leeds," mentioned that Leeds was the first city through its University to hold out a helping hand to their allies of the gas industry. He hoped it would not be long before his own profession had its chair at Leeds or some other University in the district.

This was responded to by Sir WILLIAM MIDDLEBROOK.

Mr. J. W. LEE submitted "Kindred Societies, which was responded to by Prof. BURSTALL.

LOCAL AUTHORITIES AND THE CALORIFIC STANDARD.

Deputation to the Board of Trade.

Representatives of the Corporations of Bath, Bournemouth, Brighton, Cardiff, Hastings, Newport, Northampton, and Swansea, and the District Councils of Ilford and Worthing held a conference in London last Wednesday week regarding the Gas (Standard of Calorific Power) Act, 1916.

A resolution was passed to the effect that, though in no way objecting to the principle of substituting the calorific test in place of the present luminous test, and while being prepared to assist in every way possible for the purposes of the war, the conference requested the Board of Trade not to make any further Orders under the Act which do not contain fair and reasonable provisions safeguarding the interests of consumers.

The conference appointed a deputation to visit the Board of Trade, where Mr. Garnham Roper was interviewed.

The deputation urged that five years was too long a period for the Orders to remain without being subject to revision. Municipalities were prepared to co-operate in every way during the war; but a fair and reasonable period should be fixed for the operation of the Orders, and this period should be for the war and twelve months after. If the gas companies incurred expenditure in providing plant in view of the new requirements, there would be no objection on the part of the authorities concerned to provision being made in the Orders whereby such expenditure could be met out of revenue, instead of charging it to capital; and this notwithstanding that the twelve months period after the war may have expired. It was not fair to consumers to tie-up the whole position for a longer period than one year after the war, because at that time it was possible that new considerations and conditions would arise, and which ought then properly to be gone into. If it became necessary to do this, the authorities concerned would not question the degree of calorific value or pressure. It was quite feasible that, on the expiration of one year after the war, conditions would arise entitling consumers to a reduction in the price of gas, and that they should have an opportunity of going into the question of cost.

Mr. Roper doubted whether the Act empowered the Board to deal with the points submitted. But the deputation urged that if the Act did not give this power that was all the greater reason why the Orders should not remain in operation for so long a period as five years.

Mr. W. R. Herring, accompanying the deputation in a consultative capacity, explained that the full supply of materials required by the Government only reduced the calorific value 5 p.ct.; whereas the Order made provision for a 10 p.ct. reduction.

Mr. Roper suggested that while 500 B.Th.U. was the penal limit the companies would most probably work to the accepted standard of 540 B.Th.U.

Mr. Herring said it was very much easier to work to a calorific standard than to a luminous standard, as it was possible to run very near to the 500 limit with safety, and that it was thought that the 500 B.Th.U. was the value of gas that would be supplied.

The Board seemed to indicate that it had no power to deal with the question of a sliding-scale or the financial consequences arising. The deputation, however, contested this, as the proposals submitted would leave all parties free to deal with the financial issues soon after the close of the war.

Mr. Roper intimated that the case for the authorities had been fairly put, and he appeared to be impressed by it. However, while he was not unfavourable to a shorter period than the five years, the Ministry of Munitions had requested that this period should be inserted in the Orders, as they had in a large measure induced the gas companies to make the change from the illuminating to the calorific standard. He would confer on the subject with the Ministry of Munitions and the Local Government Board.

Messrs. John Terry & Co. (as London Agents for the Company) have received from the Metropolitan Gas Company of Melbourne a cable advice informing them that the profit for the half year to Dec. 31 last was £103,534. A dividend of 6s. 6d. per share has been declared for the half year, a sum of £38,000 has been transferred to the reserve fund, and the balance carried forward is £57,472.

BRENTFORD GAS COMPANY.

Report and Accounts.

In the report which they will submit at the annual meeting of the proprietors on Friday, the Directors state that the accounts show a profit on the revenue account for the year of £107,100. After providing for the interim dividend for the June half year and fixed charges, there remains the sum of £42,293, which, with the balance brought forward from last account, makes the amount of £99,512 available for dividend. The Directors recommend the declaration of the statutory dividends, subject to income-tax—namely: At the rate of 5 p.ct. per annum on the preference stock; at the rate of 5¼ p.ct. per annum on the "A" consolidated stock; and at the rate of 5⅝ p.ct. per annum on the "B" consolidated stock. The increase in gas sold is 3·1 p.ct. over the previous year. The number of consumers is 119,412, as against 117,357 last year, an increase of 1·75 p.ct. The Directors have felt compelled, owing to the increased cost of freight, coal, and all other expenses, to raise the price of gas, as from Christmas last, from 2s. 6d. to 2s. 10d. per 1000 c.ft. They have to report the great loss they have sustained by the death of their esteemed and valued colleague, Mr. William King, who had been a Director of the Company for the past nine years. They have elected Dr. T. E. Page to fill the vacancy. The Directors congratulate the Company on the fact that 16 of their men have obtained Commissions and three Military Decorations, and that 590 have joined the Army; and they express their regret that 38 of these gallant men have given their lives for their Country, and a very considerable number have been wounded.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £491,151; from rental of meters, stoves, and fittings, to £86,141; and from the sale of residual products, to £147,704—the total receipts being £725,122. The expenditure on the manufacture of gas was £449,289; on distribution, £77,567; on management, £20,303; on rent, rates, and taxes, £29,971—the total expenses being £618,022. The balance carried to the profit and loss account is £107,100.

The working statements indicate that 215,594 tons of coal and 3,324,159 gallons of oil were used in the past year in the production of 4,289,549,000 c.ft. of gas (including 1,697,865,000 c.ft. of carburetted water gas), of which 3,921,063,000 c.ft. were sold and 3,984,916,000 c.ft. were accounted for.

SHEFFIELD GAS COMPANY'S BILL.

Approved by the Proprietors.

A Special Meeting of the Sheffield United Gas Light Company—Mr. WILSON MAPPIN presiding—was held in the Cutlers' Hall, on Monday of last week, for the purpose of considering the Bill which the Company are promoting.

The CHAIRMAN said that the Bill provided for the conversion of existing capital, and also asked for authority to raise additional capital, to change the name of the Company, and for various provisions connected with the general business. With regard to the conversion, it was proposed to issue £2 of 5 per cent. stock for each £1 of 10 per cent. stock at present held by the shareholders. This would make no difference as regarded dividend, as each shareholder would receive the same amount on his holding as previously. The object of the alteration was that a 5 per cent. stock was really a more marketable security. There could be no doubt that Parliament would sanction the conversion. It had permitted the same course to be taken by numerous other gas companies for upwards of thirty years past. With reference to the additional capital proposed, they were aware that the Company's business was perpetually increasing; and this entailed the provision of new works, &c., for which capital was necessary. The capital powers were not exhausted, as there remained £105,000 of debenture stock unissued. Unfortunately, the rate of interest on this was limited to 4 p.ct., at which it was impossible to obtain money at the present time; and it was probable that some considerable period would elapse before stock would be subscribed for at anything like so low a rate. The Company in 1915 applied to the Treasury for permission to dispose of £50,000 of this debenture stock, at which time it might have been placed; but, as he explained at the last annual meeting, they failed to obtain sanction to do so. The reasons for a change in the name of the Company was because its present title was too cumbersome. The remainder of the Bill dealt with various conditions in connection with the business necessary to facilitate the working. He moved approval of the Bill.

Mr. HANBURY THOMAS (Managing-Director) seconded.

Mr. HOBSON spoke at length against the proposals. The policy adopted by the Company in the last ten years, he said, had been regrettable, and had not shown the consideration for the consumer that was desirable. The calorific power of the gas had been reduced about 25 p.ct., and the lighting more; and it was giving great and general dissatisfaction to the consumers.

Mr. HANBURY THOMAS said that they had a sliding-scale of dividends from 7½ p.ct. upwards, which, he believed, was the oldest sliding-scale in the kingdom. If they had not had this in 1866, the dividend would have been fixed at 7½ p.ct. The result was that the Sheffield Company had been in a better position than many other companies, and at the same time had supplied gas at unheard-of prices to consumers. The standard of 500 B.Th.U. was the standard fixed throughout the country by the Board of Trade; but this was not what they intended to supply. Up to the commencement of the war the gas in Sheffield was perfectly satisfactory; and the Company knew as a fact that users were satisfied. "And," he continued, "I can promise the consumers that when the war is over we shall go back to our old quality. We believe in supplying a good article. Our business has been built on it; and we recognize that our business will go wrong if our policy is altered." As regarded the non-incandescent gas lights, they appreciated the position; and the Company would supply flat-flame burners of a suitable type, and fix them free of cost, if the people concerned would make application to them. Speaking of the present time, the management knew that the gas was not of a good quality; and the knowledge was most annoying to them. They felt that they were losing ground, and had made appeals to the Ministry of Munitions on the subject. He might even tell them that a week before Christmas they went so far as to stop the extraction of toluol, because the demand on their gas supply was such that they felt they could not keep up the quality unless this was done. The result was a visit from an Inspector and reports to London, the outcome being a communication from the Ministry, threatening them with all sorts of serious penalties under the Defence of the Realm Act. Not only were they not to stop again extracting toluol, but they must not take out less than the full quantity without written permission. Another difficulty they had was the supply of men. They had had 150 soldiers as a working party, and they were fairly satisfactory; but when they got busy, the soldiers slacked off. Then they sent some of them back to Ripon, and tried to get others from Lincoln and the Labour Exchange. But every day one or two of them disappeared; and in any event they were really no good in a gas-works. At Effingham Street, there were retorts standing idle, because they had not the men to draw the coke. They could not get good strong labourers; and if Mr. Hobson, instead of crying "stinking fish," would write to the Ministry of Munitions on the subject, he believed he would be doing some service to the Gas Company, and also to the consumers. The Company were doing everything in their power; and as soon as the war was over, the quality would go back to the usual standard.

The resolution approving of the Bill was then passed.

CHELMSFORD GAS-WORKS TRANSFER.

Amounts to be Paid for Compensation.

A report of the Parliamentary Committee bearing on the transfer of the gas undertaking was submitted at the last monthly meeting of the Chelmsford Town Council.

In presenting the report, Alderman Taylor pointed out that it had been agreed to pay compensation to the Directors of the Company and certain officers and servants upon the transfer of the undertaking to the Corporation. The Directors had suggested that they should receive £2100 as compensation; the Engineer and Manager, who received £500 a year, claimed on an eight years' basis, which would amount to £4000; and the Secretary, who received £300 a year, also claimed on the eight years' basis, which would come to £2400. There had been negotiations, and the Directors had agreed to accept £1800, the Manager, who anticipated that he might be appointed again, was willing to take £2500; and the Secretary, who was in a different position, was prepared to accept £1500. He proposed that these amounts be paid in full settlement of their claims for compensation.

The motion was carried; and the Committee were authorized to deal with the claims of other servants of the Gas Company with ten years' service.

EDINBURGH GAS WORKERS' WAGES.

Result of Arbitration.

It was reported in the "JOURNAL" for Dec. 5 last (p. 499), that the workmen employed by the Edinburgh and Leith Gas Commissioners had, through the National Union of Corporation Workers, approached the Commissioners for increased wages, &c., and that the question had been referred to a Board of Trade Arbitrator, in the person of Sheriff Louttit Laing, of Aberdeen. We set out below the requests of the men and the decisions of the Sheriff.

REQUESTS OF THE MEN.

1.—That the wages of the meter-readers should be increased by 2s. per week.
2.—That the pay of other employees should be raised by ½d. an hour (about 2s. 3d. per week).
3.—That double pay should be granted for all Sunday labour, and that overtime of all employees should be counted as time-and-a-half.

ARBITRATOR'S DECISIONS.

1.—Increase of 1s. 6d. per week.
2.—To men whose earnings (wages and war bonus) are under 30s. a week, an advance of 2s. per week; over 30s. but under 40s., 1s. 6d. per week; 40s. and over, 1s. per week.
3.—Time-and-a-half to be paid for Sunday work, and, in the case of "ordinary day-work men" at the works and in the distribution department, time-and-a-half for overtime worked during the week.

With regard to the claims of "old men and men partially fit," these are to be reserved for the consideration of the Commissioners. The findings as to wages are to be operative as from the first pay-day in November, 1916, and those as to Sunday work and overtime from Dec. 21. The cost of the concessions will be about £2000 per annum.

The Commissioners also had before them an application from some members of the Treasurer's staff for a war bonus. It was agreed to grant a bonus, as from the 15th of January, at the rate of £12 per annum to employees on the permanent staff paid monthly with salaries of £200 or under (apprentices £6), and to continue it for three months after the declaration of peace.

A private limited liability company has been formed, with a capital of £30,000, to take over the business of Shields and Ramsay, chemical and coal merchants and exporters, of Glasgow.

NEW CHARGES AT HALIFAX.

The Halifax Corporation have decided upon the following revised gas charges for non-lighting purposes, to come into operation on April 1.

Quarterly Accounts.	Per 1000 c.ft. Within Borough.	Without Borough.
	s. d.	s. d.
Not exceeding 1,000,000 c.ft.	2 0	2 6½
Exceeding 1,000,000 but not exceeding 2,000,000 c.ft.	1 10	2 4½
Exceeding 2,000,000 but not exceeding 3,000,000 c.ft.	1 8	2 2½
Exceeding 3,000,000 but not exceeding 4,000,000 c.ft.	1 6	
Exceeding 4,000,000 c.ft.	1 4	

Special meters required to separately measure gas used for non-lighting purposes will be fixed on application, at the expense of the consumer; the meter to be let on rental or sold outright to the consumer. As an alternative to the fixing of duplicate meters in residences, consumers may elect to adopt the "standard requirements system," whereby the gas used in excess of the ascertained standard requirements for lighting purposes would be charged at the non-lighting rate. This would apply equally to every residence as follows: The standard of requirement shall be the volume of gas required for efficient lighting over the year ascertained in this way: The floor area of the living or reception rooms shall be multiplied by 50, and to such total 50 p.ct. is to be added, to include the quantity required for bedrooms and other rooms and spaces. Any gas used in excess of this standard volume to be charged at the non-lighting rate. Where the proportion of bedrooms and other rooms and spaces exceeds five to one, the figure of 50 p.ct. shall be increased by 5 p ct. for each additional room or space. In premises lighted mainly by electricity, the odd gas-burners in use will be separately assessed to arrive at the standard requirement for lighting purposes per annum.

HEMEL HEMPSTEAD GAS BILL.

The Hertfordshire County Council have sealed a petition in Parliament against the Hemel Hempstead Gas Bill, 1917, and instructed the County Solicitor to oppose the Bill.

In a report on the Bill, the Parliamentary Committee of the County Council state that the Company, under their Act of 1878, have powers to supply with gas the parishes of Hemel Hempstead, Bovingdon, Abbott's Langley, King's Langley, and such parts of the parishes of St. Michael's, Northchurch, Great Gaddesden, Flamstead, and Redbourn in the county as are within a distance of three miles of Hemel Hempstead Parish Church. They now seek powers to include within their limits of supply the portion of Redbourn parish in the rural district of St. Albans which lies beyond a distance of three miles of Hemel Hempstead Parish Church. The area of the proposed extension is 3725 acres, and there is a length of 13⅜ miles of main roads and eight county bridges situated within it. None of the proposed extended area overlaps the limits of supply of other companies. The Company also seek powers to erect a footbridge between the Watford-Berkhampstead road and Featherbed Lane, and for enabling them to supply gas in bulk to any local or other authority, whether within or beyond the limit of supply, also with respect to laying pipes in any street, road, or highway. Power is also sought to repeal the existing provisions of the Act of 1878 with regard to testing the illuminating power of the gas, and to substitute a test which shall apply to its calorific value. The Committee consider that the insertion of any such provision in the new Bill should be opposed, having regard to the fact that gas of lower illuminating power could be supplied if the clause was acceded to. The Committee are also of opinion that the Bill should be opposed for the purpose of obtaining a clause for the protection of the County Council's interests in the matter of main roads and county bridges. The County Solicitor has accordingly been instructed to give the necessary notices required under the Borough Funds Act, 1872.

MANCHESTER GAS-WORKER'S DISTINCTION.

Pleasing Ceremony at Bradford Road Gas-Works.

An interesting ceremony took place on Wednesday last at the Bradford Road Gas-Works of the Manchester Corporation, when Sergeant Albert Edward Owen, of the Lancashire Fusiliers, was presented with the Distinguished Conduct Medal for gallantry and devotion to duty in the field. Owen, who is the son of an old Bradford Road gas-works employee, is 33 years of age, and he entered the service of the Gas Department when he was sixteen years old. He joined the Army early in September, 1914, and went to France in September, 1915. He saw a good deal of hard fighting in the Ypres-Armentières-Festubert sector, and at Thiepval gained the award of the "D.C.M." for "Conspicuous gallantry in action. He advanced alone along an enemy trench, and then, collecting a few men, successfully dealt with a party of the enemy. He displayed great courage and determination throughout, setting a fine example."

So as not to interfere with the routine of the works, the presentation was fixed for the dinner-hour—about 400 to 500 men and women congregating in the men's mess-room to do honour to one who had honoured them.

The Rt. Hon. the LORD MAYOR of MANCHESTER (Alderman Thos. Smethurst, J.P.) presided, and there were with him Lieut.-Col. A. J. Mitchell, Commanding Officer of the Bury Depôt of the Lancashire Fusiliers, Major Walkley, Chief Recruiting Officer for Manchester, and other military representatives. There were also present Alderman Wm. Kay, J.P., Chairman of the Gas Department, Alderman Richard Burtles, the Deputy-Chairman, Mr. John Harrison, the Chairman of the Bradford Road Station, and other members of the Gas Committee, Mr. Fredk. A. Price, the Superintendent of the Department. Mr. J. R. Hill, the Manager of the works, Mr. A. L. Holton, the Superintendent, and other officials.

The LORD MAYOR said they were met on a very interesting occasion—to present the medal for distinguished conduct in the field to an old employee of the Bradford Road Gas-Works. It was a matter of very great satisfaction to all those who were connected with the Manchester Corporation, and particularly the Gas Committee, to know that one of their men had so distinguished himself as to be entitled to the decoration. It must, he added, also be very satisfactory to the Bradford Road gas-workers themselves to have the opportunity of welcoming Sergeant Owen once more, and to show their appreciation of his gallant conduct. He was glad to learn that Owen would have something more than the Distinguished Conduct Medal to take away with him, for he understood that the staff and workmen at Bradford Road had decided to mark their sense of the occasion by presenting to him a gold watch. He (the Lord Mayor) was glad that Mrs. Owen had been invited to the proceedings. It was through the courage and example of such men as Owen that our Armies were doing so well to-day. They were very proud that Owen had won his distinction, and particularly so as he was the first employee of the Corporation to be thus honoured. The Lord Mayor concluded by calling upon Lieut.-Col. Mitchell.

Lieut.-Col. MITCHELL said it afforded him very great pleasure to attend the proceedings that day. There was no need for him to recapitulate the circumstances under which Owen gained the award. He would merely say that he richly deserved it. He had great pleasure in asking the Lord Mayor to pin the decoration on the breast of Owen. (Applause.)

The LORD MAYOR then presented the medal in the customary manner, and shook hands very heartily with Owen amid the loud applause of his fellow workers.

Sergeant OWEN, in replying, was commendably soldier-like and brief. He uttered one simple sentence of thanks to all the "ladies and gentlemen and fellow-workmen connected with this presentation." Sympathetic applause greeted him; and the Lord Mayor at once called upon

Alderman KAY to present to Mrs. Owen war saving certificates valued at £14, which had been subscribed for by the members of the Gas Committee. In a felicitous speech Alderman Kay hoped that the present ceremony would be the forerunner of many others of a like nature. He incidentally added that his own son was also serving in the same regiment as Owen.

A PRESENTATION FROM THE WORKMEN.

Mr. A. L. HOLTON, on behalf of the staff and workmen at the Bradford Road station, asked Owen's acceptance of a gold watch as a token of their appreciation of his services in the field. He sincerely hoped that Owen would be spared to be with them for a very long time to come.

A vote of thanks having been accorded to, and acknowledged by, Lieut.-Col. Mitchell.

Alderman BURTLES moved that their best thanks be tendered to the Lord Mayor for his presence that day.

Mr. J. R. HILL, who seconded, spoke of the pleasure it gave him to see that "one of his Bradford Road boys" had earned such distinction on the field of battle. They were all very proud of him.

At the conclusion of the proceedings, Owen was carried shoulder high round the works amid great enthusiasm, and greeted with the utmost cordiality everywhere.

HIGH-POWER GAS-LAMPS IN CALCUTTA.

Minutes just to hand from the Municipal Council of Calcutta state that the Gas Committee were asked to consider the comparative statement of tenders received for the supply of 106 high-power inverted incandescent gas-lamps to replace the existing Lucas street lamps.

The report stated that the Special Committee on June 15, 1916, considered the Lighting Superintendent's note regarding the higher pressures to come into force on March 1, 1917, also his proposal to replace, at an estimated cost of Rs. 11,130, all the existing Lucas lamps in the city by new pattern inverted gas-lamps, which will consume about 22 c. ft. of gas per hour, as against 30 c. ft. per hour, the approximate consumption of the existing Lucas lamps when the increased pressures are supplied. It was anticipated that a saving of about Rs. 6000 per annum would be effected by the introduction of the new lamps. The existing Lucas lamps would be thoroughly repaired, where practicable, in the lighting workshops, and utilized later on to the best advantage. The Corporation having sanctioned this estimate, advertisements were accordingly issued in the London and Calcutta papers, and four tenders had been received. After a fair trial of the sample lamps, the Lighting Superintendent recommended the acceptance of a tender for "Blanlite" pattern lamps. These lamps had been installed in the Sir Stuart Hogg Market for some considerable time, and had proved to be satisfactory. The Council decided that the tender for 106 three-light inverted gas-lamps (Blanlite pattern) and 106 wrought-iron brackets be accepted.

MAINTENANCE OF INCANDESCENT BURNERS.

American gas undertakings are giving great attention to the importance of good and efficient service, rather than cutting the selling price to the lowest limit. Mr. J. P. Comroy, the Manager of the General Gas Company, New York City, describes, in the "American Gas Engineering Journal," a scheme for facilitating the sales of gas for commercial light service, and standardizing a high-grade lighting equipment that will meet competition, consisting of an inclusive monthly charge to cover installation, maintenance, and a specified quantity of gas; thus assuring to the consumer a permanently satisfactory service, without initial or first cost.

If the consumer is willing to guarantee a minimum monthly revenue for a sufficient period to recoup the outlay, maintenance expenses, &c.,

and fair interest, it sounds good business to provide the lamps and fixing free of first charge; the only guarantee required in addition is that he will consume (or pay for) the minimum quantity of gas that will comply with these conditions. The total amount to be liquidated before the end of the contract period, besides working costs and the value of the appliances, includes all fixing expenses and items such as store-room costs and salesmen's commission on the order; and the whole of these, divided by one-third of the number of months covered, which may be 12 to 60 (one to five years), gives the minimum guarantee that is considered sufficient to make the proposition acceptable to the gas undertaking.

The cost of installation is credited to a capital account, and the balance of the monthly payments, after providing for gas, maintenance, &c., is debited to the same account; and the cost of the investment should be entirely written-off at the end of the term. The consumer is charged for gas used in excess of the guarantee at the current rate, and, in the case of straight gas companies, should be asked to limit his use of other illuminants during the period of the contract, as provided by its terms. This might be relaxed in the case of combination companies, or if the customer is also an important user of gas for other purposes. A specimen form of agreement, in addition to the usual stipulations, specifies that the consumer shall insure the appliances from damage by fire or water, pay for accidentally broken glassware, and use the company's service exclusively for lighting, to the exclusion of other illuminants, except in show-cases and other minor auxiliary displays to which gas cannot conveniently be applied.

NOTES FROM SCOTLAND.

Edinburgh Gas Commissioners Invest in New War Loan.—At a special meeting of the Finance Committee of the Edinburgh and Leith Gas Commissioners, which had been called to consider a report by the Treasurer (Mr. A. Canning Williams) as to investing in the new war loan, it was decided to recommend the Commissioners to apply for £35,500 of the 5 per cent. issue, and to make arrangements with their bankers for an advance of the purchase-money required, the advance to be for a period of not less than two years, and on the terms stated by the bank—viz., 1 p.ct. below the Bank of England rate, fluctuating therewith, with a minimum of 5 per cent. It was also agreed to recommend the Commissioners to convert their present holding of £8000 4½ p.ct. war stock into the 5 p.ct. stock. The recommendations were subsequently unanimously agreed to. The Commissioners' total war investments will now amount to upwards of £60,000.

Decreased Gas Sales in Edinburgh.—The Treasurer reported recently that the total sales of gas for the summer and autumn term (six months) showed a falling-off, as compared with the same period in 1915, of 41,555,000 cubic feet, or 5·52 p.ct. Satisfactory features in the report are the increases in the quantity consumed by prepayment consumers (15·91 p.ct.), and by gas-engines, &c. (6·12 p.ct.).

Gas Explosion at Maryhill.—Calling at a house in Maryhill from which a prepayment meter had been stolen, a Glasgow constable had a very unpleasant experience. He tried to close-up the leaking end of the pipe, and in the belief that he had succeeded he struck a match. An explosion took place; and the officer was severely scorched on the face, neck, and hands. After his injuries had been dressed, he was conveyed to the infirmary. Three persons who were in the house at the time were slightly injured.

Fined for Non-Attention to the Telephone.—At a recent sitting of the Paisley Sheriff Court, Mr. James Carmichael, the Manager of the Barrhead Gas-Works, was charged with failing to have a responsible person at the works to receive an air-raid warning, and to take the necessary action in such circumstances. He pleaded guilty. The Procurator-Fiscal explained that the gas-works were specially exempted from the lighting restrictions—on condition that there should always be somebody there to receive telephone warning of air raids. At night the works telephone was switched on to Mr. Carmichael's house; and on one occasion, when a test call was made, it was found that there was nobody in the house. This was the first case of the kind in the district. Sheriff Blair imposed a fine of £3.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 5.

Pitch is steady at 23s. to 24s. net per ton in bulk at makers' works; and there are substantial inquiries in the market for export to France. Creosote is unchanged; and quantities unsold are being taken over by the Government on the terms already announced.

The sulphate position is unaltered. Export licences are not being issued, and the demand for home purposes is good.

Tar Products in the Provinces.

Feb. 5.

There is no alteration in the market for tar products. Prices generally remain steady.

The average values of gas-works products during the past week were: Gas-works coal tar, 19s. 9d. to 23s. 9d. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3½d. to 3⅝d. Heavy oils, in bulk, North, 3⅜d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 2⅜d. to 3d. per unit; "B" quality, ¾d. to 1d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Feb.* 3.

The rigid limitation of exports to neutral countries has been followed by the total prohibition of shipments to all destinations, and it has now become impossible to obtain licences even for British possessions. So far as the open market is concerned, business has consequently been at a standstill, and values are entirely nominal. The prices fixed for home agricultural purposes remain at £15 10s. per ton for sales direct to farmers, and £15 per ton, net cash, on rails at makers' works, to middlemen.

Nitrate of Soda.

The market for this article is again dearer, and spot quotations are now 21s. 9d. per cwt. for ordinary quality, and 22s. per cwt. for refined.

Sulphate of Ammonia.

As the export of this article is prohibited, it is not much use quoting price for export. The prices for home consumption are fixed, and are quite well known.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is quieter. Though the demand generally is good, the difficulties of export increase, and the prices show some irregularity, more especially for forward delivery; while the higher freights now paid under the control methods have some influence. In the steam coal trade the lack of ready steamers seems to be the most felt. For best Northumbrian steams the current quotation is from 29s. 6d. to 30s. per ton f.o.b.; for second-class steams, 24s. 6d. is the price; and for steam smalls there is a moderate demand, at prices varying from 16s 6d. to 20s. 6d. The production is fair, in the circumstances; but the lack of sufficient tonnage is the influence most affecting steam coal. In the gas coal trade there is a good inquiry; but the delay in the arrivals of steamers checks business. Best Durham gas coals are 26s. 6d. to 27s. 6d. per ton f.o.b.; for second-class descriptions, 19s. to 19s. 6d. is quoted; and for "Wear specials" the quotation varies from 31s. to 32s. 6d. Deliveries on the long contracts are steady generally; but shipments are occasionally retarded, even where high freights are paid. Contracts for some 100,000 tons of coal for Sweden are just closed—chiefly of best steam qualities. In the coke trade the demand is fair, with a full output. Good gas coke is quoted from 32s. to 33s. per ton f.o.b.; and there is a good home demand. Coke freights, Tyne to the north of France, are firm at about 46s. 6d. per ton. It may be added that, under the Conciliation Board rules, the miners' wages in Durham will be unaltered for the next three months.

Cost of Trench Re-instatement.—The Woolwich Borough Council, who propose to increase the charge for re-instating trenches by 15 p.ct., report that inquiries show that the majority of other London authorities have, since the war, made an increase in the charges varying from 7 to 30 p.ct.

Cheap "C" Burners at Sevenoaks.—The Sevenoaks Gas Company haev had their oil-washing plant at work for the past six weeks; and Mr. J. H. Donaldson (the Engineer and Manager) reports that it is giving very satisfactory results. The Company are supplying "C" burners in place of flat-flame ones, at one-half cost price.

Pudsey Gas Company.—The annual report of the Pudsey Gas Company states that, though lighting restriction and the Summer Time change materially affected the sales of gas, and contracts for coal had been made at a slight advance upon the amount specified in the Coal Price (Limitation) Act, the Company were still able to maintain their charge for gas at the pre-war rate.

Gas Supply Troubles at Tredegar.—In last Wednesday's issue, the "Western Mail" stated that Tredegar had then been practically in darkness for several days. The gas-works are very short-handed; and the staff of stokers is being further depleted. The coal supplied, too, is not as suitable as it used to be, owing to the flooding-out of the usual source. To complete the trouble, the sharp snap of cold weather has much increased the demand on the output of the works. At night-fall on Tuesday, shopkeepers, householders, &c., had to fall back on lamps and candles.

Girls for Delivering Coke.—A writer in the "Daily Mail" on Saturday said: Mayfair received a surprise yesterday, when into one of its dignified streets there clattered a van in charge of two "coaliettes." They were two of a quartet of "coaliettes" who are being tried experimentally by the Gas Light and Coke Company for delivering coke. "It's not such hard work as you would think, and we get a lot of fun out of it," said one of the girls. "We go out with two tons of coke in the morning and two tons in the afternoon. That means that each of us handles about two tons a day. The sacks are not heavy, when you have got into the knack of handling them." The girls have shown themselves very capable; and their number may be increased—"if we can get them," as an official of the Company was careful to qualify.

Kenilworth Gas Bill.—At their meeting a week ago, the Warwickshire County Council confirmed the report of the Roads and Bridges Committee, which included the following: "The Kenilworth Gas Bill proposes to authorize the promoters to supply gas in the urban district of Kenilworth and the parishes of Balsall and Berkswell, and so much of the parish of Stoneleigh as lies north of a line from Cloud Bridge along the centre of the public road to Stone Bridge. Clause 52 of the Bill is intended to be for the protection of the County Council. This clause is similar to section 52 of the Warwick Gas Act, 1915, and is not such full protection as has been given to county councils in several recent Gas and Water Acts, and we think is not, in some ways, sufficient protection for the Council." The Committee recommended that all the powers of the Council to oppose the Bill, and to withdraw or otherwise compromise any such opposition, be delegated to the Main Roads Materials Sub-Committee.

Women Workers in the Gas Industry.

In an illustrated article dealing with the subject of war-time workers, the "Co-Partnership Journal" of the South Metropolitan Gas Company remarks that everyone, whatever may be his opinion on the abstract question of women in industry, must admit that the employment of women, not only in the office, but also on works and district, was more than advisable; it was inevitable. And the adaptability of the women to new and strange duties has been such as to surprise most people. Eleven months ago, less than 140 women had been taken on, of whom about 120 were clerks, index-readers, or show-room attendants. Now there are 813, of whom 139 are in the offices, 216 on the district, and 458 on the works. Those on the district are, according to statistics compiled by the Lady Superintendent (Miss M. H. Fawcett), engaged as follows: Show-room attendants, 35; meter-readers, 67; slot-meter collectors, 28; slot-meter repairers, 15; burner attendants, 45; gas-fire repairers, 20; lamp-lighters, motor drivers, &c., 6.

Double Gas Fatality at Brighouse.—Mrs. Ibbetson (a widow) and her granddaughter, who lived together at Brighouse, were seen entering their house on Monday night last week, and towards Wednesday evening a strong smell of gas was noticed by the occupants of adjoining premises. On forcing an entrance, the police found both women dead in bed, with the gas-tap (which is said to have been very loose) turned full on, and the place full of gas.

The Eticoal Syndicate Wound Up.—After a life of five or six years, the Eticoal Syndicate, which was connected with the British Coalite Company, has been wound up; and at a recent meeting the Liquidator (Mr. F. L. Fisher) reported what had been done. The statement of account showed £19,131 assets realized. Creditors were paid in full; and 23s. 5d. in respect of each £1 share has been distributed to the shareholders in the Syndicate.

Directors' Fees and Income-Tax.—The following remarks are from the City Notes column of "The Times:" "Our attention has been drawn to the increasing number of companies which are proposing to pay directors' fees free of income-tax. No doubt this plan is very nice for directors, at the present rate of the tax, since it means a substantial rise in their remuneration; but it is hardly credible that the shareholders realize what is involved when such a proposal is made at an annual meeting during the war. As a rule, it comes up as an apparently innocent addendum to a decision to pay the shareholders' dividends free of tax, instead of less tax—a plan which has certain conveniences and advantages for them, but which substantially gives them the same dividend as they would be entitled to anyhow out of the available profits. But the payment of fees to the directors free of tax is quite another matter. Can there be any reason why their remuneration in this respect should be dealt with any differently from that of managers and clerks?"

Scarborough Gas Company.

The Directors, in their report for the twelve months ended Dec. 31, state that, after providing for interest charges and the dividends on the preference stock, they recommend the payment of the usual dividends on the ordinary stocks for the year at the rate of 5 p.ct. per annum. Notwithstanding the effect of the war on the prosperity of the town, the lighting restrictions, and daylight saving, the sale of gas shows a decrease of only 2 p.ct. as compared with the previous year. The amount withdrawn from the reserve account to make up the sum required for dividends is £1836, as against £6708 last year. Mortgages, amounting to £35,750, bearing interest at 5 p.ct. per annum, and repayable in three years, were issued to repay 3½ p.ct. mortgages to the same amount which matured on June 30. A crude-benzol recovery plant has been installed for the extraction from the gas of benzol, &c. The working of this process made it impossible to maintain the gas at the prescribed illuminating power standard; and in view of this, application was made to the Board of Trade for an Order substituting a calorific standard. This Order has recently been made. A war bonus of 4s. per week (in addition to the increase of wages previously given) has been granted to the employees on account of the increased cost of living. The installation of stoking machinery and coke-handling plant is nearing completion, but has been delayed by the difficulty in obtaining materials.

Durham City Gas Company.—The Directors of the Company, in their report for 1916, state that the profit and loss account shows an available balance of £1832, and, this being insufficient to pay ordinary dividends by £355, they propose to take the amount from the reserve fund, and to pay 5 p. ct. on the original and 3⅛ p. ct. on the additional capital, making 10 and 7 p. ct. respectively for the year. They had been compelled to increase the price of gas by 6d., bringing it up to 3s. 10d. per 1000 c. ft.

Wages Question in Birmingham.—The Labour Committee of the Birmingham City Council last week considered the question (which had been referred to them by the Council) of extending to the non-manual employees the award of 2s. 6d. per week which was granted to the manual workers by the Committee on Production in December last. The Committee came to the conclusion that there was a distinction to be drawn between manual and non-manual employees, inasmuch as the latter received periodical advances in salary. The Committee, therefore, decided to recommend that the several Committees, in considering this year's advances of salaries of non-manuals, should take into account the increased cost of living, and, if thought necessary, grant advances rather more liberal in amount than would be done in normal times. They further recommend that where the maximum had already been reached, it should be extended temporarily during the war by a sum not exceeding £10 per annum. The advances to be given are restricted to those whose salaries do not exceed £250 per annum.

The "Fire Queen"

The Latest "Main" Gas Fire.

It is designed to co-ordinate in size with *any* modern Interior Grate.

The fire backs and heights overall are graded to coincide with the dimensions of Standard Grates. Note the appearance when in use. So like a bright coal fire, and it will pass all the "tests" for Efficiency and Ventilation.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Underground "Gasometers"—An Idea!

Mr. C. Watson has notified the Deptford Borough Council that at the next meeting he will propose the subjoined resolution: "This Council is of the opinion that all 'gasometers' within one mile of any human habitation should be placed underground, and hereby requests His Majesty's Government to immediately take such action as may be necessary to effect such change at an early date; and that a copy of same be sent to H.M. Government, the Member of Parliament for the constituency, Mr. C. W. Bowerman, M.P., and all Metropolitan public authorities."

Gas-Fire Causes Burning Fatality.—A domestic nurse in service at Keston has died from shock arising from burns, having, in some unexplained way, had her clothing set alight by a gas-fire in the nursery. She was found on the floor of the room, with her clothing in flames. There was a guard in front of the fire.

Oldbury Gas Output.—In a report submitted to a meeting of the Oldbury District Council last Friday, the Gas Manager (Mr. C. H. Carder) stated that the quantity of gas sent out during the current financial year was 112,583,000 c.ft., against 116,768,000 c.ft. for the corresponding period of last year. The Committee had decided to instal a debenzolizing plant, at a cost of about £200.

Sleaford Gas Company, Limited.—In their report to the shareholders for the year 1916, the Directors recommend that a dividend be paid at the rate of 10 p.ct. per annum, subject to the deduction of income-tax. The large increase in the cost of coals and the increase of the income-tax, though partially compensated for by the increased price of coke, leaves them, they say, no alternative but to recommend the discontinuance of paying dividends free of income-tax. There has been an increase in gas consumption, notwithstanding the lighting regulations. The number of prepayment meters in use at Dec. 31 was 843, and of ordinary meters 652—making a total of 1495.

Quality of the Padiham Gas Supply.—A statement on the subject of the gas supply was made by Mr. Russell (the Chairman of the Gas Committee) at the last monthly meeting of the Padiham Urban District Council. He said that, in addition to the extraction of benzol and toluol, the quality of the gas had varied in consequence of the coal used. At one time the deliveries from the collieries had been about one-third of the requirements, so that two-thirds had had to be taken out of the stock which had accumulated since August, 1914. In the first place, the quality of this coal was much below the average; and a considerable portion had suffered through being stored in the open. The questions of gas storage capacity and shortage of skilled labour also influenced the matter. Coal deliveries were now coming along very well; and it was to be hoped they were now through this winter's troubles. He pointed out that the price of gas at Padiham had as yet only been advanced 2d. per 1000 c.ft.

Bury St. Edmunds Gas Company.—The Directors of the Bury St Edmunds Gas Company propose to dispense in future with the August half-yearly meetings; and a resolution will be moved at the forthcoming meeting authorizing the payment of an interim dividend in the course of the year.

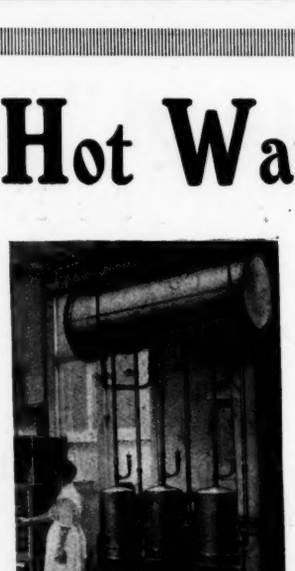
Gas-Works Coal Stocks Requisitioned in Norway.—A message through Reuter's Agency states that the Municipal Supply Council at Christiania have decided to requisition the stocks of coal, coke, and other fuel in the gas-works, and to distribute them with the stocks seized from private sources. The Council have established a central office to undertake the work of distribution.

Gas Shortage in Schleswig-Holstein.—It is stated by the "Schleswigsche Nachrichten" (according to a Reuter telegram) that the coal-gas supply of the whole province of Schleswig-Holstein is becoming exceedingly scarce. The authorities of the larger towns—including Kiel, Flensburg, Rindsburg, and Hadorslobon—have issued warnings to the public to save to the utmost extent possible, and to retire to bed before nine o'clock. It is expected that by the end of this month street lighting will be entirely suspended in a number of towns.

Lighting of Dublin.—At a meeting of the Dublin Corporation, the High Sheriff (Mr. W. P. Delaney) reminded the members that, when striking the estimates last year, the Council cut off £4000 in respect of public lighting. This, he said, had necessitated the extinction of every second lamp in the city. In order further to carry out the wishes of the Council, the Public Lighting Committee had also curtailed the electric lighting. Much criticism had arisen; and he now wished to make it clear that the Committee were anxious to afford the citizens adequate light, but that they desired to carry out, as far as possible, their instructions as to economy. As Chairman of the outgoing Committee, he mentioned that, in addition to the £4000, they had also saved £2000, which meant about 1½d. in the pound. When such economy had been secured, he thought the citizens would tolerate a little inconvenience.

Walker and Wallsend Gas Company.—The Directors, in their annual report to the proprietors, state that the revenue for the year ended Dec. 31, 1916, amounted to £59,352, and the expenditure to £49,926, leaving a balance of £9426 as the profit for the year. The balance of undivided profits as per last statement was £13,083, and with the balance of profits for 1916 makes a total of £22,509. This it is proposed to appropriate, after allowing £2734 for interest on mortgages, reserves, &c., in the payment of dividends of 5, 4⅜, and 5⅜ p.ct., less income-tax, on the various stocks, leaving a balance to be carried forward to next year's account of £12,725. The revenue account shows an increase in the receipts as compared with the previous year of £6515, and in the expenditure of £9659. The results for the year proved satisfactory. Coal cost more; but, on the other hand, coke values had greatly improved. Application has been made for authority to substitute a calorific power standard for the standard of illuminating power.

Hot Water for Factory Use.



95% of the Factories in any district require hot water for various purposes.

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"IRONCLAD" Circulator

is being extensively adopted in Fac ories, Workshops, etc. Can be connected up in batteries to supply any number of taps. Constructed throughout of Iron, there is practically no maintenance required.

Illustration shows three "Ironclads" providing hot water to 13 taps in Canteen Scullery. *They are equally suitable for supplying Hot water required for many Industrial processes.*

We offer the services of our Water-Heating Expert for any proposition.

THE RICHMOND GAS STOVE & METER CO., Ltd.,

WARRINGTON AND LONDON.

Pilfering from a Gas-Works.—At the Tower Bridge Police Court recently, Robert David Hall, a labourer, of Peckham Park Road, was charged with stealing three bags and 14 lbs. of lead, the property of the South Metropolitan Gas Company, Old Kent Road. Accused, who pleaded guilty, in reply to the Magistrate, said he had served for more than four years in the army, having been discharged as medically unfit. The Solicitor for the Company said they had no desire to be vindictive; but they could not allow petty thefts to take place without being punished. The Magistrates regretted accused had placed himself in such a position, and imposed a fine of 20s.

Tipton Gas Matters.—At the Tipton District Council meeting last Tuesday, there was a lively discussion with regard to the gas undertaking. Mr. Powell, commenting upon the report of the Gas Committee, alleged that money was being lost on the concern. He had, he said, not attended the meetings of the Gas Committee, because he considered it waste of time to do so, as any proposal he might make was "over-ridden" by the clique who happened to be there. The Chairman of the Committee (Mr. Doughty) characterized Mr Powell's remarks as a gross slander. He said if Mr. Powell had done his duty by attending regularly the meetings of the Committee, he would not have asked the questions he had. The gas-works, he asserted, were never doing better than at present.

Gas Explosion at Leeds.—While Gas Department workmen were endeavouring to locate an escape of gas in premises in Crawford Street, Leeds, an explosion occurred which blew out the whole of the front of the house, and slightly injured a child. Very little other damage was done.

Primitiva Gas Company and the Buenos Ayres Municipality.—"Shareholders of the Primitiva Gas Company will," said "The Times" in their "City Notes" last Tuesday, "be glad that a new Intendente has been appointed at Buenos Ayres. This will not automatically put an end to the Company's troubles; but it means that progress in the settlement of the differences between the Company and the Municipality can now be resumed. It will be recalled that last autumn negotiations for a settlement had almost been successfully completed when the Intendente of Buenos Ayres resigned, and that pending the appointment of his successor the matter had necessarily to remain in abeyance. The dividend on the preference shares is now a twelve-month in arrears, owing, among other things, to the failure of the Municipality to pay their gas bill, which amounts to something like £200,000. The new Intendente has an excellent opportunity, which there is good reason for believing he appreciates, of helping to remove the unfortunate impression which the prolongation of the question in dispute has made on the minds of European investors."

STOCK MARKET REPORT.

BUSINESS on the Stock Exchange was again last week of a somewhat lethargic character; the War Loan naturally being the prime consideration. Much speculation is indulged in as to its prospects; and optimist and pessimist warmly press their several views. In this connection, it may be observed that there is not altogether a general feeling of satisfaction entertained that either the best or sufficient means have been adopted to get at the small individual savings of the million, which, in the aggregate, would provide a very large contribution.

In the gilt-edged market the 4½ p.ct. War Loan remained very firm; and Consols, after a somewhat halting start, improved and succeeded in touching a fraction above 52, closing firm in common with Home Government issues generally. Home Rails were quiet, but in better request. The Foreign Market was also quiet, under the pressure of the Government mobilization scheme. French Loans closed firm at an advance, and Brazilians profited by the prospect of an early resumption of cash payments. But little was done in Americans; the market being upset by the agitation in Wall Street consequent on German relations. Canadians were, as usual, affected similarly. Argentines were a little better on the report of brighter harvest prospects. The general tendency in South Africans was dull. In the Miscellaneous group, shipping took the German submarine threat very calmly, and in other prominent lines there was no feature of note.

In the Gas Market, the increase in activity noted last week was maintained, and from the prices of bargains recorded the values of several issues appeared to be inclined to advance. News from Argentina seems to indicate that a step has been gained towards a settlement of the Primitiva Company's claim against the Buenos Ayres Municipality; but from experience one hesitates to form too sanguine expectations. In the Money-Market, rates ruled firm for the greater part of the week, with an easier tendency at the close.

Bargains done for cash during the week were as follows: On Monday, Brighton and Hove ordinary 118, 118½, Buenos Ayres debenture 59, 59½, Commercial 4 p.ct. 74½, 74¾, Gas Light ordinary 71½, ditto maximum 56½, 56⅝, 56¾, 57, Imperial Continental 73, Primitiva 40s., 40s. 7½d. On Tuesday, Buenos Ayres debenture 59, 59½, Commercial 4 p.ct. 74½, Barnet "A" 137, 137½, ditto "C" 137, 137½, Gas Light maximum 56½, ditto preference 70, Primitiva 40s., 40s. 7¾d., ditto preference 58s. 9d., 60s., 62s. 6d, South Metropolitan 77½, 78, Southampton 78½, 79. On Wednesday, European 9⅜, 9½, Gas Light ordinary 71½, 72, ditte preference 69¾, 70, 70¼, ditto debenture 55, 55¼, Monte Video 8, South Metropolitan 77, 77½, ditto debenture 55, 55¼, 55½, Southampton 78½, 78⅞, Tottenham "B" 87, 87½. On Thursday, European 9½, 9⅜, 9½, Gas Light ordinary 71¾, 72, ditto preference 69½, 70, Guildford preference 82, 82½, ditto debenture 82, 82½, Imperial Continental 74, South Metropolitan 77½, 78½, Wimbledon 90. On Friday, British 34⅝, Commercial debenture 52, Gas Light ordinary 71½, 71⅝, 71¾, 72, ditto maximum 56½, ditto preference 69¾, 70¼, 71, ditto debenture, 54½, Primitiva preference 61s. 3d., ditto debenture 79, 79⅜, 79½. On Saturday, South Metropolitan, 78½.

The Bank rate is 5½ p.ct., as fixed on the 18th of January.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div. or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref. .	..	65—70	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	62—64	..
574,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅛—6⅛	5—5½	..
50,000	10	Feb. 26	16	15/-		2¾—30	25—27	..
383,110	10	,,	7	7/-	Bournemouth Gas and Water { 10 p.c. / B 7 p.c. / Pref. 6 p.c. / 4 p.c. Deb.	15—15¾	11—11½	..
115,000	10	,,	6	6/-		13½—14	9½—10	..
159,740	—	—	—	4%		..	71—73	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consolid. .	261—266	85—87	..
734,920	,,	,,	†11	53/9	Do. B New . .	204—209	82—84	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	85—90	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb. .	91—93	67—69	..
217,380	,,	Feb. 26	11	10½%	Brighton & Hove Orig. .	208—213	160—165	..
244,200	,,	,,	8	7¾%	Do. A Ord. Stk.	154—159	115—120	118—118½
530,000	20	Mar. 26	12½	22/6	British	44—45	34—35	34⅜
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk. .	88—90	66—68	..
245,771	,,	,,	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	58—63	59—59½
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1½—1¾	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref. . .	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	82—83	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk. .	106—108	73—75	74½—74½
560 000	,,	,,	5⅛	46/8	Do. 3½ p.c. do. .	103—105	68—70	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	52
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	36—38	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	58—60	..
278,400	—	—	—	11⅛%	Croydon B and C 7 p.c..	..	175—185	..
—	—	—	—	10%	Do. E	..	..	..
499,270	Stk.	—	6	5⅛%	Derby Con. Stk. . . .	123—125	100—105	..
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd. . . .	17½—18	9—10'	9¼—9½
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. / 3½ p.c. max. / 4 p.c. Con. Pref. / 3 p.c. Con. Deb. / 10 p.c. Bonds	98—102	71—73	71½—72
2,600,000	,,	,,	3½	3½%		76—79	55—58	56½—57
4,062,235	,,	,,	4	4%		93—93	69—71	69½—71
4,674 850	,,	June 11	3	3%		72½—74½	54—56	54½—55½
130,000	,,	,,	10	10%		..	..	..
258,740	,,	Mar. 12	5	4⅛%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16½	8—9	..
26,600	—	—	—	9⅛%	Hornsey 7 p.c.. . . .	..	125—135	..
131,000	Stk.	Mar. 12	7⅛	7⅛%	Ilford A and C. . . .	151—154	105—110	..
65,780	,,	,,	6⅛	5⅛%	Do. B	115—118	82—87	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb . . .	92—94	71—74	..
4,940,000	,,	May 14	9	4½%	Imperial Continental .	150—160	73—78	73—74
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,242	,,	Mar. 12	6⅛	6⅛%	Lea Bridge Ord. 5 p.c. .	119—121	87—92	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A / B	211—213 / 146—148	85—87	..
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	74—76	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3⅝—4½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	89—93	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	8—8½	8
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98⅝—99½	74½—75½	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 25	7/14/0	7/8⅜	North Middlesex 7 p.c. .	14—15	10½—11½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7¼—7¾	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B . .	128—131	95—100	..
100,000	50	,,	12	11%	Do. C . .	118—121	88—93	..
52,000	50	,,	10	9%	Do. D . .	..	..	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5⅛—6	1⅞—2½	40/.—40/7½
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref. .	4⅞—5	55/.—65/-	58.9—62.6
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	79—79½
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb. .	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.. / 5 p.c. Deb. .	10⅛—11	8—8½	..
125,000	50	July 1	5	5%		47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	188—192	..
203,984	,,	,,	10	10%	Do. B	223—224	188—192	..
523 500	,,	,,	10	10%	Do. C	220—222	188—190	..
90,000	10	May 28	9	6/-	South African. . . .	10⅛—11⅛	..	..
6,693,895	Stk.	Feb. 10	5/4/0	44/-	South Met. 4 p.c. Ord. .	111—113	77—79	77½—78½
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb. .	72½—74½	54—56	55—55½
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	144—146	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	110—112	79—81	..
135,000	—	—	—	48/4	Do. West Kent . .	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	,,	May 14	5	5%	Southampton Ord. . .	99—102	77—79	78½—79
120,000	,,	Feb. 12	7½	7½%	Tottenham { A 5 p.c. / B 3½ p.c.	135—138	120—123	..
782,275	,,	,,	6	5⅝%		115—117	89—91	87—87½
181.255	,,	June 26	4	4%	District { 4 p.c. Deb.	87—89	65—67	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	103½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—			..
30,000	,,	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c. .	151—156	117—122	
255 636	,,	,,	6¼	63/9	Do. B 3½ p.c. .	129—134	101—103	..
108,075	,,	,,	5/17/3	55/1½	Do. C 3½ p.c. .	110—115	88—93	..
352,000	,,	,,	6¼	57/6	Wimbledon 5 p.c. . .	117—122	90—95	90
98,000	,,	,,	6⅜	63/9	Epsom 5 p.c. . . .	121—126	98—103	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk. . . .	66—69	51—54	..

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

The London County Council and the Gas Light and Coke Company's Bill.—A report on the L.C.C. *agenda* for to-day's meeting states that, as at present advised, it is thought that it will not be necessary to oppose the Gas Light and Coke Company's Bill; but that if ultimately it should be found necessary, the Parliamentary Committee will, in due course, recommend the Council to authorize the presentation of a petition in the second House.

Belfast Gas Output.—At a meeting of the Belfast Corporation, Alderman Craig said that, from Dec. 21 to Jan. 17, the gas produced amounted to almost 285 million c.ft., as against 267 millions in the corresponding period of the previous year, being an increase of 6 65 p.ct. From April 1 last year to Jan. 17 the send-out was 1978½ million c. ft., against 1945 milions for the corresponding period of the previous year —showing an increase of 1 72 p.ct. These figures, he thought, testified to the progressive nature of the undertaking. Mr. P. Dempsey said he had been told they had saved £8000 a year on the public lighting; but he thought military requirements had been exceeded, and that the present conditions were a danger. It was agreed to consult the military authorities on this subject. The Gas Committee have decided to subscribe £26,000 to the new War Loan.

At Lancaster, the wages of the labourers have been increased by 1s. 9d. per week; and other workers have got a war bonus of 3s. per week.

As the result of an escape of gas at a house in Belfast, four children were discovered in bed in a state of collapse. They were removed to the Royal Victoria Hospital, and ultimately recovered sufficiently to be able to return home.

The Oldbury District Council, at their meeting on Friday, considered a notice from the Birmingham Corporation of their intention to apply for a standard of calorific power of 500 B.Th.U. gross, in place of the standard of illuminating power. No opposition was offered to the proposal.

Bertie Greenwood, aged 25, a fitter, while working at the shops of Messrs. W. C. Holmes & Co., of Huddersfield, was caught, last Thursday morning, by a travelling electric crane, and pinned against some machinery, his spine being fractured. He died shortly after removal to the infirmary.

The Todmorden Town Council have decided to grant a war bonus of 2s. 6d. per week to employees in all departments who are in receipt of less than £150 per annum, to continue until six months after the termination of the war. Most of the Corporation employees have had a previous bonus of 1s. 6d. weekly, to which this new one is an addition.

In a report issued on Saturday, the Gas Committee of the West Bromwich Corporation recommended the installation of two additional purifiers at the gas-works, and that the tender of Messrs. C. & W. Walker be accepted. The cost of the purifiers, including valves and connections complete, is £2002; and the amount will be charged against revenue.

Since the outbreak of the war, applications have been received at the Department of Commercial Intelligence from a large number of firms in all parts of the United Kingdom and abroad, who wish to get into communication with British manufacturers or producers of various classes of goods which have previously been obtained from Germany and Austria-Hungary. Applications have been recorded during the past few days for the names of manufacturers or producers of (among other articles) incandescent mantles. British manufacturers or producers now in a position to supply are invited to make application for the names of the inquirers.

H.M. Trade Commissioner in Australia (Mr. G. T. Milne) reports, says the "Board of Trade Journal," that the Perth City Council have allocated the sum of £20,000 for the purchase of gas and electrical plant; and he suggests that British manufacturers interested in the probable requirements of the Council should instruct their agents to write to the City Electrical Engineer, Town Hall, Perth (W.A.).

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 31.]

Nos. 1040—1395.

BEDDALL, C.—"Revolving-lensed lamp for lighting streets, &c." No. 1358.
CAMMELL, LAIRD, & CO.—"Valves and cocks." No. 1368.
CARTER, G. J.—See Cammell, Laird, & Co. No. 1368.
CROFT, C. M.—"Removing carbon deposits from retorts." No. 1229.
CROFT, C. M.—"Discharging or projecting machines for coal, &c." No. 1391.
HELPS, G.—"Fuel radiants for gas fires, cookers, &c." No. 1112.
KENT, W. G.—"Liquid meters." No. 1387.
LARKIN, F. S.—"Elbows or bends for flue-pipes, &c." No. 1235.
LEOPARD, C. W.—"Joints for pipes and tubes." No. 1213.
MARTIN, F.—See Kent. No. 1387.
OATES, W.—"Packing for scrubbing towers." No. 1107.
POORE, P.—"Destructive distillation of wood, &c." No. 1348.
ROBINSON, E. B.—See Oates. No. 1107.
SULMAN, H. L.—See POORE. No. 1348.
UPTON, H. J.—"Illuminating device." No. 1392.

APPLICATIONS TO AVOID OR SUSPEND PATENTS.

No. 22,862 of 1910. Grantee: STILL. "Apparatus for distilling hydrocarbons dissolved in tar-oils." Applicants: BAGLEY, MILLS, & CO., LTD.

No. 23,459 of 1910. Grantee: STILL. "Coke-ovens." Applicants: BAGLEY, MILLS, & CO., LTD.

LICENCES GRANTED.

Nos. 22,861 of 1910, 22,863 of 1910, 3269 of 1911, 24,806 of 1911, and 28,072 of 1912. Grantee: STILL. Applicants: BAGLEY, MILLS, & CO., LTD.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral Countries unless they are posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointment Wanted.

LADY SHOW-ROOM ATTENDANT, &c. No. 6273.

Appointments, &c., Vacant.

MANAGER COKE-OVEN AND BYE-PRODUCTS PLANT. No. 6271.
SULPHATE MAKER. Dover Gas-Works.
WATER GAS AND TAR PLANT, &c,, WORKER. No. 6272.

Plant, &c. (Second Hand), for Sale.

AMMONIACAL LIQUOR STILL. Robin Hood Coke Works, near Wakefield.
EXHAUSTER AND ENGINE. Aldershot Gas, Water, and District Lighting Company.

Meetings.

BARNET GAS AND WATER COMPANY. No. 139, Cannon Street, E.C., Feb. 26. 12.30 o'clock.
BARNSTAPLE GAS COMPANY. Bridge Chambers, Barnstaple, Feb. 17. Twelve o'clock.
RIDDINGS GAS COMPANY. No. 139, Cannon Street, E.C., Feb. 27. 2.30 o'clock.

TENDERS FOR

Coal.

MILFORD HAVEN URBAN DISTRICT COUNCIL. Tenders by Feb. 11.

ROYAL 8VO. CLOTH GILT, LETTERED, 15s. NET.

Clauses and Precedents in

ELECTRICITY, GAS, & WATER LEGISLATION.

Being a Comparison of the Provisions contained in the Model Bills, in Special and Municipal Acts, and in Provisional Orders, 1910 to 1914, relating to these Public Services.

Compiled and noted by JACQUES ABADY, of the Middle Temple, Barrister-at-Law.

WALTER KING, "GAS JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

SOLE MAKERS OF THE & COAL WASHER.